Report of the Ontario Commission on Truck Safety

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The Ontario Commission on Truck Safety

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Ontario

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31 March 1983

The Honourable James Snow,
Minister of Transportation & Communications,
Queen's Park,
Toronto, Ontario.

Dear Mr. Snow:

On the 8th day of October, 1981, I was appointed Commissioner to investigate all non-economic matters relating to the safety of trucking in the Province of Ontario.

Having performed the duties as set out in the Order-in-Council O.C. 2886/81, I am pleased to submit my final report and recommendations.

Robert J. Uffen
Commissioner

Ontario
Executive Council

Order in Council

On the recommendation of the undersigned, the Lieutenant Governor, by and with the advice and concurrence of the Executive Council, orders that

WHEREAS large trucks represent a major perceived threat for motorists;

AND WHEREAS accidents involving trucks may be occurring in ways and for reasons that are practically preventable;

The Honourable the Minister of Transportation and Communications therefore recommends that Dr. Robert Uffen be appointed as a Commission to be known as the "Ontario Commission on Truck Safety".

The Honourable the Minister of Transportation and Communications further recommends that the Commission be authorized:

1. To inquire into all matters relating to the safety of trucking in the Province of Ontario except those matters which relate primarily to economic regulation;

2. To make such interim or final recommendations to the Minister of Transportation and Communications as the Commission considers appropriate.

O.C. 2886/ 81

Without limiting the generality of the foregoing, the Commission shall inquire into and report on:

(a) Driver Standards including driver training and education, the classified driver licensing system, medical standards and restrictions for drivers and driver management;

(b) Vehicle Standards and Specifications including vehicle length and configuration, brakes and braking standards, tires, load securement, commercial motor vehicle inspections and truck maintenance practices;

(c) Rules of the Road which are of particular applicability to the operation of trucks including following distances, reduced speed limits and lane and truck movement restrictions;

(d) Enforcement and Sanctions;

(e) Public/Industry Perceptions and Expectations, insofar as they may affect, or be perceived to affect, the safety of trucking in the Province of Ontario.

The Commission may, as necessary, utilize expert advisors and consultants, hold public hearings, seminars and symposia, receive briefs and submissions and shall provide full opportunity for interested individuals and organizations to present their views to the Commission.

The Commission, which is to deliver its final report within eighteen months, will emphasize recommendations that are fully supportable and likely to yield practical improvements in highway safety.

Recommended _____
Minister of Transportation and Communications

Concurred _____
Chairman

Approved and Ordered October 8, 1981

_____
Lieutenant Governor

ACKNOWLEDGEMENTS

The Commission is indebted to many individuals and organizations in the trucking industry, in labour unions, in government agencies, in various private associations and to the general public. I am particularly indebted to the members of my Advisory Group who gave their time and advice freely and expertly, in the service of the public. As a novice in matters concerning trucking, I depended on them in many ways and I believe they gave credibility and perspective to the activities of this Commission.

The Commission benefitted enormously from the managerial skills, energy and knowledge of Mr. Greig Beatty who was seconded from the Ontario Ministry of Transportation and Communications to be the O.C.T.S. Secretary. He organized Public Hearings, interviews and visits, acknowledged extensive correspondence, managed the budget and was untiring in drafting official records and research reports. In particular, I wish to acknowledge his conduct of the public opinion survey (see pages 152-155) with Mr. Frank D'Onofrio, my very able Research Assistant and ergonometrician.

I am especially grateful to Mrs. Lillian Preston, my personal Secretary for over a decade, who kept me and our files in order and served me loyally throughout the year.

ONTARIO COMMISSION ON TRUCK SAFETY

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Mr. Oakie is Executive Vice-President and General Manager, Hamilton Automobile Club. Mr. Oakie is a member of the Management Advisory Committee, American Automobile Association; Canadian Automobile Association Club Officials Committee; Advisor to the C.A.A. National Board of Governors and Chairman of the Ontario Motor League Public Affairs and Legislation Council. Mr. Oakie is past-President of the Hamilton Safety Council.

Mr. Don Parke

Mr. Parke is Executive Director of Public and Regulatory Affairs of the Ontario Trucking Association. Mr. Parke has served on industrial committees concerned with regulations, safety, labour negotiations and public relations. He has been Director and President of the O.T.A., President of the Canadian Trucking Association and served as a Director and President of the Metropolitan Toronto Citizens Safety Council.

Mr. Fred Johnston

Mr. Johnston is the elected Business Representative of the Teamsters Union Local 938. He was a truck driver for twenty years and has been associated with the Union as a member for 35 years. Mr. Johnston has held office in the Teamsters Union for various terms during the past 25 years.

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CHAPTER I INTRODUCTION

1.1. Background

1.1.1. Truck drivers and the trucking industry play a key role in the transportation of goods in the Province of Ontario. The industry consists of two main groups of carriers: for-hire and private. For-hire carriers transport freight that is owned by others, while private carriers are those who transport their own goods. Over the past quarter of a century, the trucking industry in North America has more than tripled in size and in Ontario the truck population more than doubled between 1971 and 1981. The industry offers "door-to-door" services for its customers which are very attractive. As a consequence, the truck mode of transportation continues to attract an increasing share of total freight movement. Without the trucking industry, our economy would be severely hampered.

The trucking industry differs from other modes of transportation in that it is not dominated by two or three huge corporations. Rather, it is an industry with a large number of independent companies. For example, there are over twenty medium-sized trucking companies and a host of smaller firms, regularly transporting goods each way between Toronto and Montreal. As a result, the industry is highly competitive. The major union for the truck drivers is the Teamsters Joint Council, but many drivers belong to non-unionized firms or are owner-operators. The general public is becoming acutely aware of the number of trucks which use our public highways, especially in areas where rush-hour or week-end traffic congestion is endemic. For example, at the Toronto Keele Street Permanent Counting Station, the average traffic eastbound on the Highway 401 By-pass is well over 230,000 vehicles per day of which close to 40,000 are trucks of one kind or another. More than one-half of these are heavy straight trucks or tractor-trailers. Most trucks are driven three to ten times as many kilometers per year as the average automobile.

The trucking industry is well aware that safety is of prime importance. Not only do most truckers wish to avoid accidents to others and to themselves, because of the anguish which may follow, but they are also very conscious of the undesirable costs. No-one in his right mind wants to run the risk of severe injury or death and the possible destruction of a truck and cargo worth as much as a quarter of a million dollars, if it can be avoided by good safety practices. In fact, the Ontario Trucking Association entitled its submission to this Commission: "Safe Trucking is Good Business". However, the current economic slump is having its adverse effects. The total demand is down and the competition for business is fierce. The established private carriers may be able to weather these adverse economic conditions but even some of these are experiencing severe financial problems. Smaller, independent operators

are caught between high operating costs and lower demand, and between high interest rates and low rates for their services. There exists a great temptation to economize, to "cut corners" and to let good safety practices slip, even to the point of ignoring the law.

1.1.2. The Select Committee on Highway Safety of the Ontario Legislature examined the overall situation in 1976 and reported its findings and recommendations in September 1977. Section VIII of its report was devoted to: "The Truck". The Select Committee observed that our society has become dependent on the truck as the primary carrier of goods to market, and forecast that this role would grow into the 1980's. The Committee discovered that the general public perceived trucks as a menace and it was often urged to do something about their number, size and speed. The Committee also attempted to establish whether the public's fears were justified. It found that the information available at that time (1974 data) was insufficient to establish with certainty the role played by the various kinds of trucks. In 1974 the available data did NOT suggest a disproportionate involvement of trucks in accidents! At that time, trucks made up 14% of all registered motor vehicles, were involved in only 12% of the accidents but in 17% of the fatalities. However the Select Committee did come to the conclusion that the public concern was "not without foundation". We shall see that the situation has deteriorated since then.

The lack of data about different categories of trucks made it impossible at that time to determine whether heavy or light trucks accounted for a disproportionate share of accidents. During 1982, truck category data have been aggregated and made public for the first time by the Ontario Ministry of Transportation and Communications. We shall see that large trucks are now a very large and increasing proportion of the commercial vehicle traffic.

The Select Committee found that most owners preferred self-regulation to government regulation, but the Committee concluded that, while most fleet owners were doing a commendable job of self-regulation with respect to safety, more was needed. So it made seven recommendations about trucks. We shall see that many of the problems are still with us.

1.1.3. There have been accidents involving trucks for as long as there have been trucks, but public concern and public debate over their safety has increased dramatically since the report of the Select Committee in 1977. Many more motorists now perceive large trucks to be a major threat. Various individuals, organizations and the news media have expressed concern over what they perceive to be a deteriorating situation. For demographic reasons there is growing use of the public highways by many types of vehicles but, for economic reasons, the trends are toward larger trucks and smaller cars. Furthermore, new highway development is at present less likely than in the past.

Some road capacities have been reached or soon will be reached and congestion is almost certain to increase.

Letters from the public expressing frustration and alarm have multiplied. During the public hearings of this Commission, over 400 letters were received by either the Commissioner or by the Minister of Transportation and Communications. The Ontario Government was frequently criticized for failing to control the operation of trucks adequately on public highways. In Chapter VIII section 8.2. we present the findings of a public opinion survey that this Commission conducted between April and July 1982. It is clear that the motorists are alarmed by the speed and manoeuvering of large trucks and are irritated by what they consider to be intimidating actions. On the other hand, the truck drivers are equally alarmed by the apparent lack of knowledge, lack of courtesy and improper driving of many motorists.

By 1981 truck registrations had risen to 17%, the trucks were involved in 15% of all the highway traffic accidents reported in Ontario, but accounted for 26% of all the vehicles involved in fatal accidents. These are very much higher than in 1974 (14%, 12%, 17%). During 1982 there seems to have been a sharp drop in the accident total but it will be several months before we will know the percentage distributions. Whether or not the trucks caused all the accidents they were involved in is quite another question!

1.1.4. Nevertheless, when a large truck is involved in an accident, the damage is likely to be greater and more spectacular than for accidents between automobiles. In addition, the delays caused by overturned trucks and spilled cargos are often much longer. It is not surprising then that truck accidents appear to be receiving greater press and television attention. Newspaper and television reports find truck accidents newsworthy, especially if there are fatalities, and Coroner's inquests are reported in great detail. The photographs may make spectacular viewing. The public debate has become increasingly acrimonious acrimonious and extravagant language is used.

Canadian and American Automobile and Motorist Associations have not only been active in presenting the views of their members to governments, but also to the media, in order to influence general public opinion. For example, in the April 1981 edition of the Canadian Motorist magazine, an article entitled "Knights No More" by Steve Howe, severely criticized the trucking industry. The article purports to quote an unidentified truck driver called "Chuck":

> "I might have passed the four-week course that Toronto's George Brown College offers to men and women who would join the ranks of that rugged Export-plain smoking, beer swilling, cowboy boot-wearing clique. These are the knights of the road .....".

and again:

> "Even if Chuck adhered to the 60-meter following distance regulation, he knows he needs more than those two and one-half seconds to bring his 60-footer from 100 kms. per hour to a dead stop. Dead, that's the key word. But it won't be me, he chuckles, amused by his own bon mot. Thirty-two times safer eh? I like the odds."

Not surprisingly, this article brought vigorous objections from truck drivers and owners who obey the laws, help the police, and bring aid to motorists who are in difficulty. The Trucking Associations are crying "foul" and are claiming the allegations are exaggerated and unjust.

1.2. The Problem

1.2.1. It is instructive to have an overview of the accident data which are now available. The details about every type of truck from delivery vans to tractors plus semi-trailer-concrete-mixers were published for the first time in 1982 in the M.T.C.'s "Ontario Motor Vehicle Accident Facts 1981", partly because of representations which were made before this Commission. The original data have been aggregated in Table I in a form which brings out the relative roles of light trucks, straight trucks and articulated vehicles. The latter are trucks which have horizontal hinge points, such as a tractor plus a trailer or two. We shall see later in Chapter IV that the number of articulation points is an important factor in the stability of long "truck trains".

TABLE I

NUMBER OF VEHICLES INVOLVED IN MOTOR VEHICLE ACCIDENTS IN 1981

Vehicle Type	Severity of Accident							
	Fatal		Injury		Property Damage		Total	
	#	%	#	%	#	%	#	%
Automobile	1275	62	92,680	75	194,838	75	288,793	73
Light Truck	325	16	13,390	11	32,689	13	46,404	12
Straight Truck	54	3	1,593	1	4,203	2	5,850	1
Articulated Truck	148	7	1,918	1	4,971	2	7,037	2
Other Vehicles	257	12	14,527	12	22,064	8	36,848	10
Total	2,059	100	124,108	100	258,765	100	384,932	100

From Table I we see immediately that by far the majority of motor vehicle accidents were between automobiles and did not involve trucks at all. Most of the truck accidents involved only light trucks such as pick-ups and delivery vans. Next came "other" vehicles which included motorcycles, buses, snowmobiles and even horses and buggies. Heavy trucks were involved in only 3% of all the accidents, but in 10% of the fatal accidents. Surprisingly, most of the truck-related accidents occurred in broad daylight, in dry weather, on straight and level roads. While most of the truck accidents do not occur on provincial highways, the highway truck accidents are usually the most severe. The fatalities appear to occur more often in rural areas even though most of the property damage occurs in urban areas. In 1981 more trucks were involved

in accidents in January than in any other month and the fewest were in April. Friday is the worst day of the week and Sunday the best. Generally, the longer the truck, the more likely that it will collide with a fixed object, roll over, or catch fire. At the time of the collision, most trucks were moving straight ahead but many were stopped or parked and many were making left turns.

1.2.2. As the trucking industry has grown, so also has the size of trucks. In this way the industry has increased its productivity and competitive position relative to airlines, shipping and railways. There are obvious economic incentives to increase truck sizes and carrying capacities. On the other hand, the average size of automobiles has been decreasing for about a decade and, while this trend cannot continue indefinitely, it may well continue for a few more years. There are already available for importation, if approved, quite small, one and two passenger motor cars. Small passenger cars become very vulnerable to accidents with larger commercial vehicles because of wind, blowing snow, splash and spray and the sheer differences in mass.

The relative mix of vehicles according to size in the motor vehicle fleet is quite important provided there is a strong correlation between size and accident frequency or severity, but statistics available so far have been inconclusive. Nevertheless there is a growing belief among North American motorists that the truck-car size disparity is a major factor and that the motorist will lose out. The likelihood of a fatality in a truck-car collision may be as much as thirty times greater for the occupants of a small car than for the driver of a heavy truck. Projections of the mix of vehicles into the future are extremely difficult to make because of the influence of unknown or unpredictable factors such as world fuel prices, manufacturer's costs and import policies.

1.2.3. In Ontario all motor vehicles are regulated by authority of the Highway Traffic Act. Trucks are also regulated by the Public Commercial Vehicles Act. Buses are regulated by the Public Vehicles Act. In addition, the federal and local municipal governments have implemented a wide variety of regulations designed to promote and ensure a safe and efficient motor carrier industry, and each level of government has developed its own regulatory system according to its own priorities and jurisdiction. For example, the federal governments in both Canada and the U.S.A. set the standards for the manufacture and importation of new vehicles. Provincial and state governments in the U.S.A. generally set driver qualifications, driver licensing and vehicle standards and rules of the road. Municipal governments may restrict size, weight and commodity type on certain urban roadways. These rules and regulations may overlap and vary between jurisdictions for many reasons. Included are: road design and capacity; traffic volumes; geographic and weather conditions; safety

experience; environmental concerns such as noise; administrative practices; intermodal competition and differing political philosophies.

Provincial and state regulations limit overall vehicle length, width, height and axle weights and these limits vary considerably. Differences may be due to varying road widths, or road and bridge structural design. For example, Ontario permits heavier but shorter commercial vehicles than New York State or Manitoba. Commercial vehicles longer than 100 feet are permitted in a number of U.S.A. and Canadian jurisdictions but Ontario restricts the total truck combination length to 21.0 meters or 68.9 feet. Generally speaking, the differences in weight and size limits do not correlate with the level of industrialization but rather with road design and the severest weight limits in Canada are in the Yukon and Ontario.

Drivers' hours of work are restricted by provincial regulation if the vehicle is driven only within the province, but interprovincial and international (U.S.A.) operations fall under federal legislation. Sunday trucking comes under the Lord's Day Act in Canada which is a federal statute enforced provincially under the authority of the Attorney General.

The provincial and territorial governments in Canada and the state governments in the U.S.A. are trying to achieve greater uniformity in driver licensing and control programs, vehicle standards, rules of the road and traffic safety through organizations like the Canadian Conference of Motor Vehicle Administrators; Roads and Transportation Association of Canada and the American Association of Motor Vehicle Administrators. Reciprocity has been achieved to some extent within Canada and to a lesser extent with the U.S.A. but there is still considerable lack of uniformity which is unlikely to change very rapidly.

1.2.4. Governments must be vigilant in protecting the public safety. They must however use their legislative powers reasonably and avoid imposing unwarranted or misguided regulations, and the accompanying costs, on the general public. Care must be taken to make clear distinctions between being involved in an accident and being the cause of that accident. Accidents are complex, unexpected and unplanned events resulting from the breakdown of human behaviour, vehicle behaviour and the environment, so it is rarely possible to identify a single cause but rather, a sequence of contributing factors. Causes may be direct or incidental. For example, a direct cause may be a tire failure but indirect causes may have been poor maintenance or excessive speed. Effective counter-measures require an understanding of these contributing factors and of their inter-relationships.

Generally speaking, motor vehicle involvement information is much more readily available than causation or culpability information. Culpability

in motor vehicle accidents implies a responsibility by an individual or an organization for a negligent act or a lack of prudent or reasonable action in the circumstances. The courts have provided the mechanism by which the degree of legal responsibility or guilt of culpable acts is determined, but sometimes the courts are limited by the inadequacy of the various laws governing traffic safety. Similarly the scope of the laws and regulations may be inadequate for law enforcement officers to obtain convictions and penalties which are sufficient to produce real deterrence of culpable behaviour. Penalties and sanctions may prove to be, by themselves, inadequate to achieve the ultimate objective of reducing the accidents and fatalities from whatever cause, which occur on our roads and highways.

1.3. Methodology

1.3.1. As the Commissioner was NOT an expert on either trucks or safety, he felt the need of advisers with experience in the various aspects of truck safety. So at his request, the Minister of Transportation and Communications invited several knowledgeable individuals to serve on an Advisory Group to the Commissioner. The members of this group were distinguished in their own fields and collectively provided both expertise and many years of experience at senior levels of responsibility. Included were: legal, medical, educational, engineering, policing, regulatory, managerial, workers' and the motoring public points of view. The members of the Advisory Group served voluntarily as a public service, and without remuneration.

Thus the Commissioner had available to him the Advisory Group's advice on sources of data, existing regulations, technical issues, research under way and policy options. Members regularly attended the public hearings in various parts of the province and participated in the discussions which took place. As well as the public hearings, several informal working sessions were held at which their views were sought about presentations which had been made or written briefs which had been received from interested parties. They reviewed the consultants' reports and research reports and offered criticism, and from time to time they responded to specific questions from the Commissioner and assisted him in arranging visits to the U.K. and U.S.A. to witness experiments, trials and road tests. They advised the Commissioner about the preparation of the Commission Report but they cannot be held responsible in any way for the conclusions reached, or the recommendations made, by the Commissioner.

1.3.2. During the early autumn 1981, a questionnaire was sent to all individuals, agencies or institutions which were known to be, or likely to be, interested in the activities of the Commission. They were asked to indicate if they would like to be put on the mailing list, if they would like to attend a public hearing and the preferred location, whether they would make a written submission, and the issues which interested them the most. After discussion with the Advisory Group, the Commissioner chose eight cities and held nine public hearings throughout Ontario (see Appendix I). As much as possible, the hearings were held in easily accessible public buildings such as city council chambers or motels with conference facilities.

Prior to each hearing, notices were placed in local newspapers approximately three weeks in advance, and a press release was issued a day or two before-hand as a reminder. In order to accommodate people on shift work, the hearings were frequently divided between day and evening sittings. It

was found that Friday evenings were poor. A mutually acceptable schedule was arranged in advance with those who had indicated that they wished to make a presentation and for each hearing, a suitable focal subject was chosen without limiting the general discussion. In this way we were able to cover publicly most of the topics of likely interest. At each hearing, ample opportunity was provided for the presentation of general public views. In order to encourage participation, there was no testimony under oath or formal cross-examination, but the discussion periods were frequently lively and participants were free to challenge statements if they so wished. Even so, some people were shy of the public format and were reluctant to speak out, so they approached or wrote to the Commissioner later. The local press representatives were usually present. All proceedings were recorded and the tapes have been preserved, but transcripts were not typed unless there was a specific request.

The first hearing in Toronto was a little more formal than the others and was devoted to the identification of the issues and the terms of reference and procedures of the Commission. The ninth and final hearing was again held in Toronto three months after the other hearings had been completed, in order to give interested parties the time and the opportunity to read and assess the submissions of other interested parties and then to respond and rebut if they so wished. It was quite a vigorous hearing, some very extravagant language was used, but the interveners generally behaved in a civilized fashion. Attendance across the province gave some indication of the geographic distribution of public interest. It was high in Toronto, Hamilton and Windsor, moderate in Kingston, Ottawa, London and Thunder Bay, and poor in Sudbury. We shall see in Chapter VIII, section 8.1.1 that this correlated somewhat with the geographic accident statistics.

1.3.3. A number of interviews and meetings were held with special interest groups where more time was necessary than could be allotted at a public hearing. For example, the Commissioner was invited to the Ontario Provincial Police Traffic Sergeants' Seminar in Toronto in March 1982 where he was able to spend a full day discussion on enforcement and regulatory problems. The Commissioner also attended a Seminar on Drinking and Driving sponsored by the Faculty of Law at Queen's University, Kingston. Two full days were spent with the Research and Development Branch of the Ontario M.T.C. Sessions were held with several Trucking and Safety Associations; the Ontario Petroleum Association; the Ontario Motor League; and George Brown College, where the Commissioner received practical instruction and road testing in the operation of a tractor plus semi-trailer. He also spent part of a day accompanying the driver of a tractor-trailer, courtes of Sears Limited, and part of one night accompanying an Ontario Provincial Police Traffic Officer on the 401 Highway. The Commissioner's staff attended several meetings of safety research groups, automobile clubs and coroners'

inquests involving trucks. The details are set out in Appendix II. Throughout the Commission's activities, periodic Information Bulletins were distributed to interested parties.

1.3.4. The Commissioner was able to attend several very valuable meetings in the U.S.A. and while there, to interview representatives of truck drivers, truck owners, automobile associations and federal government agencies. These included a special session on human factors at a seminar on heavy truck safety, sponsored by the U.S. Transportation Research Board. Later on he had profitable interviews with representatives of:

American Automobile Association
American Association of Motor Vehicle Administrators
American Trucking Association
Bureau of Motor Carrier Safety
Federal Highway Administration
Highway Users Federation for Safety & Mobility
International Brotherhood of Teamsters
Interstate Commerce Commission
National Highway Traffic Safety Administration
Truck Trailer Manufacturers Association

The Commissioner took advantage of the opportunity, provided by a visit to the United Kingdom on other business, to meet with representatives of the U.K. Department of Environment and Transport who were knowledgeable about driver testing and training, vehicle standards, freight control and road safety. He was also privileged to visit the Transport and Road Research Laboratory at Crowthorne where he witnessed field testing of some new "lorry rear-underide protectors". These are relatively inexpensive, replaceable truck rear bumpers which are designed to absorb some of the energy in the type of fatal collision involving automobile passengers who smash in under the rear of a truck. The tests were considered to be successful.

Transport Canada also provided the Commissioner with the opportunity of witnessing actual field tests of brake anti-lock devices at their Motor Vehicle Test Centre, Blainville, Quebec. The stopping distance and vehicle stability of a loaded tractor plus semi-trailer were observed at various speeds under adverse road conditions. He also had the benefit of discussions with Transport Canada officials concerning the regulation of hazardous cargos and of the importation of very small vehicles.

1.3.5. From the beginning, it was soon apparent that certain issues were going to be of paramount public concern and likely to require more detailed investigation or analysis than could be carried out by the Commission staff in the

time available. So the Commissioner sponsored three independent research project of great interest to Ontario:

(a) car-truck size disparity and safety
(b) a survey of public perceptions and expectations
(c) a two-day test and evaluation of some overlength tractor-trailer combinations.

The car-truck size disparity study was carried out by De Leuw Cather Canada Ltd. (DELCAN). The contract was awarded by tender and is discussed further in Chapter VIII. The public opinion survey was carried out by the Commission staff, Mr. Greig Beatty and Mr. Frank D'Onofrio with the aid of a consultant, Mr. David Hieatt, who is an expert in conducting and interpreting such surveys. The survey is also discussed further in Chapter VIII. The overlength vehicle road demonstration was a cooperative effort initiated by Intercity Truck Lines Ltd. but coordinated by the Ontario Ministry of Transportation and Communications with the participation of the Ontario Provincial Police, International Carriers Ltd., Motor Carriers Ltd., the Ontario Trucking Association and members of the Advisory Group.

In addition, the Commission engaged the services of Professor G.J. Wilde to survey recent non-English, European literature on truck safety and to advise on human factors in highway safety. The full cooperation of the Ontario Ministry of Transportation and Communications was obtained throughout, so that the Commissioner had the benefit of the many experts who are cited in the references and Appendices.

CHAPTER II ACCIDENT INFORMATION

2.1. Sources of Information

2.1.1. In order to answer many of the questions which arise about the numbers, causes and types of accidents involving trucks, including whether the public perceptions coincide with the facts, it is necessary to have reliable data. The data should be correct, capable of being compiled statistically for comparison with those from other jurisdictions, and giving the kinds of information which can lead to appropriate corrective action. Too often the data from one source are not interchangeable with data from another, e.g. from province to province or with the U.S.A., and too often they leave out crucial facts, e.g. mechanical failures, type of vehicle combinations. When accident statistics change markedly, it is frequently impossible to be certain of the true explanation.

The Ontario M.T.C. does succeed in producing annually the Ontario Motor Vehicle Accident Facts which is an aggregation of vast numbers of individual reports from around the province. In addition the M.T.C. publishes numerous scientific and technical reports such as those of the Research and Development Branch or of the Transportation Regulation Operations Division. However, much of the needed information must be sought from other provinces, the Canadian government, other countries and private organizations such as the Canadian Medical Association.

It is important to understand the true causes of truck accidents in order to take the best corrective actions. Involvement in an accident is not the same as causing an accident. Cause is not the same as liability or culpability because the latter includes the attribution of negligence and blame. In many accidents there is no single cause but rather a series of contributing factors involving mechanical failures, the environment and human failures. In order to analyze such factors objectively, it is necessary to obtain reliable information about such things as the numbers and types and sizes of vehicles; the numbers and types of drivers; the distances travelled; the weights and types of loads carried as well as the numbers and types of accidents. Accident data are frequently expressed in terms of exposure rates, e.g. the number of fatalities per 100 million kilometers travelled, per year. Since most trucks are driven much farther each year than passenger cars, their exposure is many times greater. The number of accidents per vehicle, or per driver, may be quite different from the number per kilometer.

2.1.2. The Traffic Accident Information Data System (T.R.A.I.D.) is the only major Canadian national accident data bank and is maintained and operated by the Road Safety Directorate of Transport Canada. All reportable motor vehicle traffic accidents in Canada are included, statistical analyses of these data

are conducted regularly and summaries of the statistics are produced. The lengthy time required to collect and code the data and the different methods of reporting by the provinces, unfortunately render this information partially obsolete by the time it can be summarized and published, and not very useful for detailed analysis of accidents involving trucks. Transport Canada is also involved in the sponsorship of a University-based multi-disciplinary accident investigation project (see section 2.3.) and in the undertaking of various other accident studies. The annual publication entitled: Motor Vehicle Traffic Accidents was discontinued by Statistics Canada in 1976. It had reported data from T.R.A.I.D.

Statistics Canada now publishes the following motor vehicle related information annually:

(a) Road Motor Vehicles - Fuel Sales, Catalogue 53-218

(b) Road Motor Vehicles - Registrations, Catalogue 53,219

(c) Causes of Death, Catalogue 84-203

(d) Vital Statistics, Catalogue 84-206

(e) Crime and Traffic Enforcement Statistics, Catalogue 85-205

2.1.3. The current Ontario Motor Vehicle Accident Report has been used by all police forces in Ontario since 1977. The original purpose of the reports was to help establish causes and liability but they have since been revised and used for statistical analysis as well. The report requires the police to give much specific information about the condition of the people, vehicles and the environment at a traffic accident so it is long and complicated. Some technical factors cannot be assessed adequately at the scene of an accident and the police officer may not be trained to recognize them. In any case the police are expected to carry out a wide variety of duties at an accident, often under difficult circumstances, so it should not be surprising if the reports are of limited use for statistical analysis.

Large police forces, like the Ontario Provincial Police, have the resources to collect the needed data, to analyse them and to do their own researc but most municipal police forces cannot do so. All police forces submit copies of their accident reports to the M.T.C. where they are included in a master file from which useful statistics are obtained despite the limitations of the original reports.

2.1.4. Truck accident data sources in the U.S.A. are generally more sophisticated than in Ontario and Canada. Although the American experience is not directly applicable to Ontario because of differences in such variables as road character and economic regulations, the major federal U.S.A. data bases provide a valuable source of information:

(a) The Fatal Accident Reporting System (F.A.R.S.) is an aggregation

and summary of the various State reports on fatal traffic accidents. It provides valuable information regarding some aspects of fatal accidents and of vehicle and driver characteristics. It includes only fatal accidents and suffers from the limitation that it relies on State reporting, which may not be uniform. There is no comparable Canadian data bank dedicated to fatal traffic accidents. Statistics Canada catalogues 84-203 Causes of Death and 84-206 Vital Statistics summarize deaths from all causes, motor vehicle accidents being only one of a myriad of categories listed, so the data presented are very general in contrast to the detailed American F.A.R.S. material.

(b) The U.S. Bureau of Motor Carrier Safety (B.M.C.S.) Accident Reports are aggregations of reports filed by regulated interstate carriers involved in any accident resulting in death, injury or $2,000 or more in total damages. The data are of a high level of detail. However, not all truck accidents are included.

(c) The U.S. National Accident Sampling System (N.A.S.S.) comprises thirty accident research teams in selected sites across the U.S.A. The program was implemented in 1979 and eventually is expected to include seventy-five teams. As more accidents are investigated, more reliable data will be generated, thereby allowing better analysis and understanding. The data are compiled into national totals based on geography, population and type of roadway.

(d) The Truck Inventory and Use (T.I.U.) Survey is conducted by the U.S. Bureau of the Census about every five years and is a source of exposure data which can be merged with accident data to derive truck accident rates based on distance travelled. The T.I.U. is a statistical sampling of all registered trucks in the U.S.A. The latest one was conducted in 1982.

(e) In addition to the major federal U.S.A. data holdings, various state governments and research centres such as the Highway Safety Research Institute (H.S.R.I.) at Ann Arbor, Michigan, and the Highway Safety Research Center at Chapel Hill, N.C., are active in specific truck accident issues. For example, one of the data banks maintained by the H.S.R.I. contains all multi-disciplinary accident investigation reports conducted in the U.S.A. and also those generated in Canada during the seventies, by Transport Canada.

2.1.5. The purpose of Coroner's Inquests is to evaluate circumstances relating to specific cases of accidental death so that similar deaths may be prevented in the future. One of the greatest benefits of Coroner's Inquests is public education through the intensive media coverage usually provided. The facts surrounding the death in question are presented to a jury by witnesses, some of whom may be "expert witnesses". The jury usually then makes a series of recommendations. Approximately 70% of all recommendations are eventually implemented by one or other of the authorities or organizations affected. Some

recommendations are too general, largely because the jury is made up of laymen who may not be able to deal adequately with the technical facts or who may be unaware of all the options available as counter-measures. On the other hand, attendance at such inquests by experts and interest groups may lead them to conclusions and courses of action, additional to those the jury recommended. Since the beginning of 1980, there have been more than thirty Coroner's Inquests which dealt with traffic accidents involving heavy trucks, so synthesis of the accumulated recommendations should be a help in identifying recurring problem areas.

2.1.6. Many individual insurance companies have developed their own accident reporting programs which are then used by the truck companies they insure. Sophisticated accident reports intended to help determine cause, fault and preventability are often provided, to be completed by the driver with the help of a company safety supervisor. The effectiveness of such programs in reducing the frequency or severity of accidents is not publicly available. Although the insurance companies generate accident records for their own use, industry-wide data have not been aggregated because the insurance companies are usually not willing to disclose such confidential information. Despite these limitations, insurance companies do constitute a potential source of good truck accident information. The data used in determining whether or not to insure an individual carrier, and at what rate, could be useful for the analysis of truck accidents in general.

The Insurance Bureau of Canada's (I.B.C.) annual publication entitled: Automobile Insurance Experience, provides a summary of motor vehicle premiums earned and claim payments made, by member companies (excluding British Columbia, Saskatchewan and Manitoba). This publication satisfies Provincial requirements for a statistical summary of the automobile insurance industry's premiums and claims. It is an actuarial document broken down by coverage, vehicle type and province. In 1981, I.B.C. member companies paid out slightly more than $560 Million of bodily injury and property damage claims (229,000 claims) for passenger cars in Ontario, and over $11 Million (2,700 claims) for interurban trucks. Thus the average cost per claim for bodily injury and property damage for private passenger cars was over $2000 and approximately one half that for trucks. The compilation and release of other types of accident data, more closely related to the causes, could serve as a useful source of truck accident information.

2.1.7. Especially in the case of large carriers, a responsible company will try to do all it can to understand the factors which caused one of its vehicles to be in an accident, since it is in their own interest to minimize the disruptions and losses which result. Like insurance companies, these could also be

a potentially valuable source of accident information, but again there are problems of confidentiality and of access. Fortunately, associations representinging groups of trucking companies are also interested in maintaining and analyzing the accident data of their affiliates in order that individual members can benefit from the accident experiences of others. For example, the Ontario Trucking Association (O.T.A.), the Ontario Petroleum Association (O.P.A.) and the Private Motor Truck Council of Canada (P.M.T.C.C.) are involved in, and concerned about, the collection of adequate reliable accident data and information in Ontario. Elsewhere the North American trucking industry takes an active part in the collection and analysis of accidents, through major groups such as the Canadian Trucking Association (C.T.A.), the American Trucking Association (A.T.A.) as well as affiliated groups like the Motor Vehicle Safety Association (M.V.S.A.).

Automobile associations such as the Canadian Automobile Association (C.A.A.), American Automobile Association (A.A.A.) and Ontario Motor League (O.M.L.) as well as their localized affiliated clubs such as the Hamilton Automobile Club, are well-organized groups dedicated to serving the interests of their memberships. Monitoring the level of road safety is a primary objective of the automobile clubs, including the collection, analysis and publication of truck-car accident information as well as original research.

Private organizations, which represent either the trucking industry or the automobile clubs, are often accused of presenting statistics intentionally designed to suit their own purposes. The information published by these organizations may be biased to the point where their use in objective evaluations of truck-car safety issues becomes doubtful. For example, the current open hostility between the A.T.A. and the A.A.A. has produced some controversial literature on the accident rates of heavy trucks, so while they have both devoted substantial effort, the results may be perceived as propaganda rather than objective research.

The Transportation Safety Association of Ontario (T.S.A.O.) is one of nine safety organizations authorized under the Workers' Compensation Act, formed by employers for the purpose of education in accident prevention. The T.S.A.O. has twelve area representatives throughout the province, and could be an additional source of data. However, T.S.A.O. discovered in 1978 that only 6% of all personal injuries were the result of vehicle accidents so they decided to devote less attention to vehicle accidents and more to other kinds such as workers' slips and falls. At the Commission's Sudbury public hearing the T.S.A.O. posed the question: "Who will pick up what is being abandoned and is there a need?"

The Teamsters' Joint Council, in its submission to the Commission,

recommended that "the M.T.C. should develop accurate, reliable, statistical information as to the cause of truck accidents in much greater detail than is presently compiled".

2.2. Important Statistics

2.2.1. Ontario has the largest number of motor vehicles of all the provinces of Canada. In 1981 the total was almost 5,300,000. Over one-third of all passenger cars and over one-quarter of all commercial vehicles in Canada were registered in Ontario. To put it another way, there is one motor vehicle for every licensed driver and six motor vehicles for every ten residents of Ontario. Table II provides a summary for 1981.

TABLE II

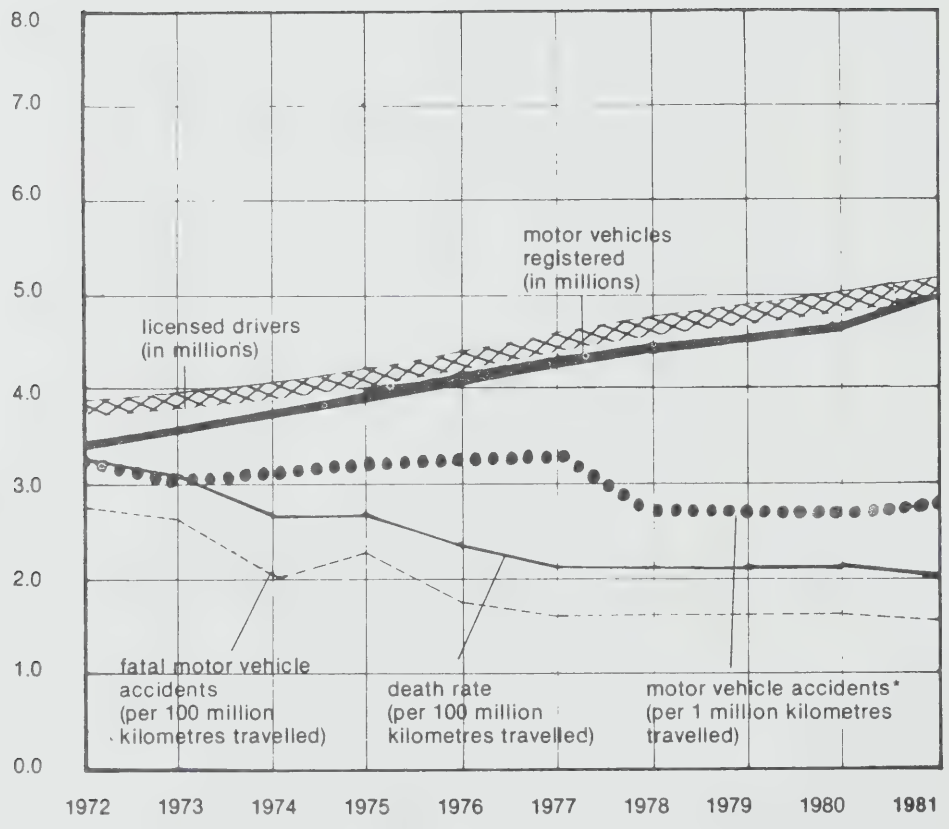
SUMMARY OF 1981 ONTARIO REGISTERED MOTOR VEHICLES

Type of Vehicle	Number	Percentage
Passenger cars	4,192,961	79%
Light trucks	724,878	14%
Straight trucks	102,113	2%
Tractors (with trailers)	69,147	1%
Other	210,322	4%
TOTAL	5,299,471	100%

These figures may not be the precise populations because of difficulties experienced within the Vehicle Registration System. A new system was developed and implemented in December 1982 which has eliminated the difficulties. In any case, even if Table II is imprecise, it still identifies the mix of vehicles correctly. We see that there were almost five times as many passenger cars as trucks. Passenger cars and trucks comprised 79% and 17% respectively of the total number of vehicles. We see also that approximately 80% of the trucks were light trucks, i.e. vans and pick-ups, about 10% were straight trucks and about 8% were tractors with trailers. Until recently, all trucks were registered in one category and it was impossible to distinguish between different types. The Ontario Motor Vehicle Accident Facts 1981, gave numbers of accidents for one hundred types of vehicles including: ambulances, hearses, fire trucks, school buses, motorcycles and street cars. Fifty-six were classified as trucks of one kind or another, so this Commission has chosen to aggregate the numbers for light trucks, straight trucks and articulated vehicles for purposes of analyzing accident rates. In 1981 almost 95% of the trucks in Ontario were light trucks weighing 5000 kilograms or less. Only 3% were large trucks grossing over 40,000 kilograms.

During the seventies, the Ontario truck population more than doubled and it is increasing at a greater rate than the total number of vehicles. The commercial vehicle population has been increasing at a rate of more than 10% per year, while the passenger car increase has been only 6.5% per hear. Manufacturer's sales records indicate that much of the truck increase has been due

Trends in Motor Vehicle Registrations, Licensed Drivers, Motor Vehicle Accident Rates, Death Rates, Fatal Accident Rates 1972 - 1981



*On January 1, 1978 the reporting criterion for property damage only accidents was raised from $200 to $400.

Source: Ontario Motor Vehicle Accident Facts, 1981

to the growing popularity of light pick-ups and vans. Whether or not these trends will continue is debatable. Sales data and registrations for 1982 are not yet available but there appear to have been substantial declines. Although the Ontario vehicle registration data provide some indication of the numbers, types and growths of motor vehicles on the province's roads, they do not provide estimates of the vehicles from outside Ontario using our roads, nor exposure information like kilometers travelled or bype of roadway travelled.

2.2.2. Ontario is a highly motorized society. In 1981 over five million residents were licensed to drive which is close to 60% of the entire provincial population. The Ontario Classified Driver System is discussed more fully in section 3.1., and under this system, drivers of automobiles, small trucks and some towed vehicles require a class G licence. Drivers of straight trucks or combination in which the towed vehicle is not over 4,600 kgms. require a class D licence, and class A licence holders are permitted to operate any tractor plus trailer or truck-trailer combination. Table III provides a summary for 1981.

TABLE III

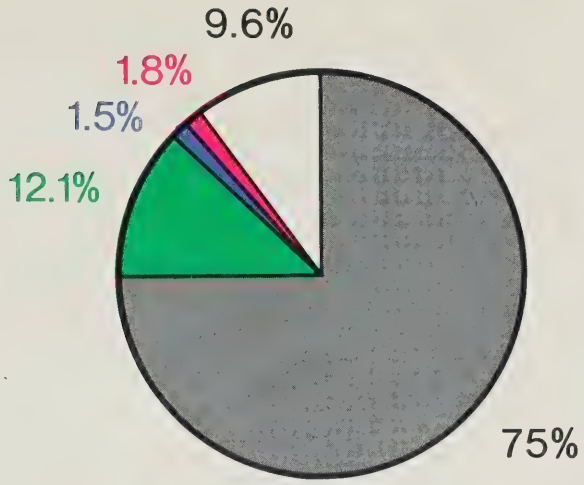
SUMMARY OF 1981 DRIVER LICENCE STATISTICS

Class of Licence	No. of Males	No. of Females	Total	
G	2,619,844	2,165,795	4,785,639	94%
D	149,046	2,316	151,362	3%
A	125,194	805	125,999	2%

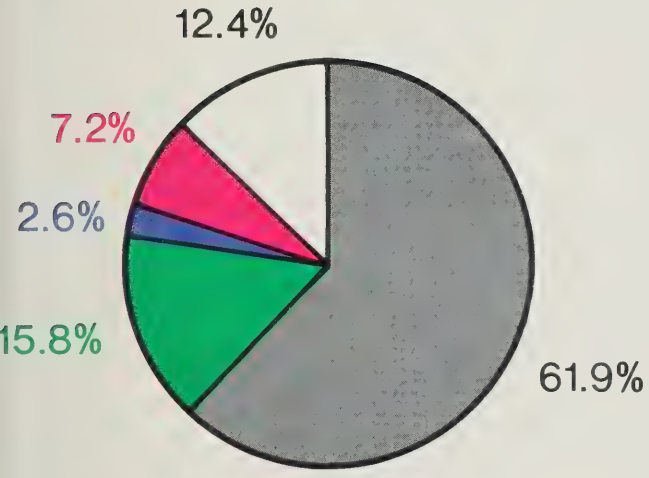
Class G, D and A licence holders represent 94%, 3% and 2% respectively of all licensed drivers in Ontario last year. The truck driver population is increasing at a greater rate than the car driver population and between 1980 and 1981, the licensed car and light truck driver population increased by 2.5% while the Class A and D licensed driver population increased by 4.4%. Surprisingly, the Class A licensed driver population decreased by 8% while the Class D licensed driver population increased by 18%.

In the last ten years, the total driver population in Ontario has increased on average by 4.4% per year but recently this rate of increase has slowed. There were 2.6% more licensed drivers in Ontario in 1981 than in 1980. The licensed driver population is increasing at a greater rate than the resident population and the majority of all licensed drivers are male (58%). Truck driving is predominantly a male-dominated occupation representing 99% of all Class A licensed drivers and 98% of all Class D licensed drivers in Ontario.

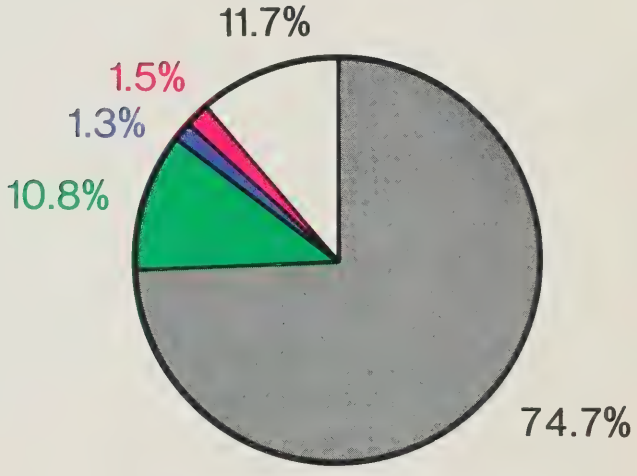
PROPORTIONS OF TYPES OF VEHICLES INVOLVED BY SEVERITY OF ACCIDENTS



TOTAL REPORTABLE ACCIDENTS



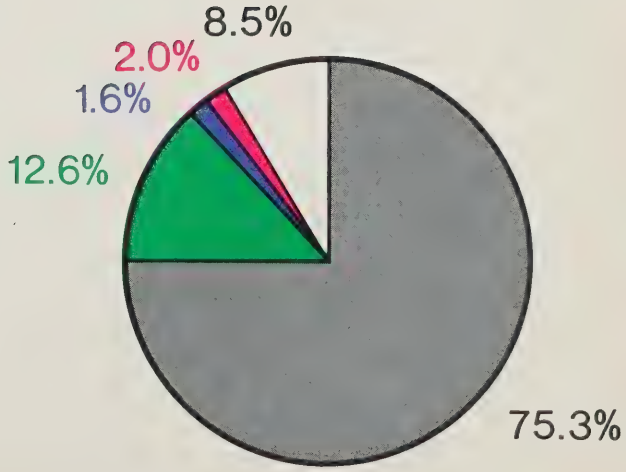
FATAL ACCIDENTS



PERSONAL INJURY ACCIDENTS

LEGEND

- AUTO
- ARTICULATED TRUCK
- STRAIGHT TRUCK
- LIGHT TRUCK
- OTHER (M/C, BUS, ETC.)



PROPERTY DAMAGE ONLY ACCIDENTS

2.2.3. Figure 1 shows the trends in accident and death rates over the past decade. The figures for 1981 are subject to revision but the trends can be seen easily. Figures for 1982 will not be available for a few months but there are indications that there has been a sharp, significant and welcomed decrease in the total number of accidents, and in the fatalities, for all types of vehicles with the possible exception of motorcycles. This is probably due to the sharp drop in vehicle usage brought on by high operating costs and the sharp decline in business activity during 1980-82. The 1981 Statistics Canada Catalogue 53-218 entitled: Road Motor Vehicle Fuel Sales shows net sales of gasoline and diesel fuel have been decreasing since 1979. Over the past decade, the numbers of vehicles and the numbers of licensed drivers have steadily increased and so have the numbers of accidents, but the accident rates and the death rates have declined. The death rate per 100 million kms. travelled, declined from 3.4 to 2.0 but it will be very difficult to reduce it further.

It is instructive to examine the distribution of accidents among types of vehicles for accidents of different severity. Fig. 2 shows the distribution in 1981 for fatal accidents, for personal injury, for property damage and for the total accidents which involved automobiles, light trucks, straight trucks and combination articulated trucks. It is clear that 75% of the total reportable accidents involved automobiles but only 1.8% involved large articulated trucks, i.e. the tractor plus one or more trailers which attract so much public attention. It is also clear that these same large articulated trucks are involved in a disproportionately large percentage of the fatal accidents. The number of such articulated vehicles has been growing and there are great economic pressures to increase the proportion further. The implication is that the proportion of fatalities will increase and the motorist may suffer the most, unless corrective actions are taken.

2.2.4. The situation in the U.S.A. is similar. The U.S. National Highway Traffic Safety Administration (N.H.T.S.A.) Fatal Accident Reporting System (F.A.R.S.) indicates a general upward trend in the involvement of heavy trucks in fatal accidents in that country. For 1979-80, large trucks were involved in just under 6% of all accidents but in almost 12% of the fatal accidents. Based on estimates of exposure, trucks were involved in fewer accidents per mile than were passenger cars, but had almost twice the fatal accident rate per mile. Therefore, although large trucks were less likely to be involved in an accident than cars, once a truck was involved in an accident, serious injury and death were much more likely to occur. (See N.H.T.S.A. "Large Truck Accident Causation", July 1982. Fatal accidents involving large trucks increased in the U.S.A. from 1976 to 1979 but then decreased in 1980 and 1981. The current economic recession may be forcing a reduction in heavy truck travel and this short term decrease in exposure would seem to explain the recent trend toward declines in truck

accidents. In the long term however, large truck exposure is increasing relative to that of the other road users, and this could result in a higher proportion of fatal accidents involving large trucks in years to come. According to William Scott, Director of the N.H.T.S.A.'s National Centre for Statistics and Analysis, heavy trucks may be involved in up to 25% of all fatal U.S.A. highway accidents by 1990!

2.3. Accident Investigation

2.3.1. The degree to which accidents should be investigated, and the manner in which it is done, depends on the objectives of the investigation, the facilities and personnel which are available and the costs involved. In this section we will review recent developments in police practices and in the use of Multi-disciplinary Accident Investigation Teams. Accident investigations may be conducted at increasing levels of intensity:

Level I investigations are relatively simple and are usually conducted by a police officer at the accident and summarized on the Ontario Motor Vehicle Accident Report. Its primary function is the recording of information relating to the individual vehicles and persons involved in the accident, for the purpose of laying charges and establishing liability. In addition, the report contains other sections relating to vehicle, driver and environmental conditions which the police officer is required to complete. This information may be used by researchers for widely different areas such as road design improvements and driver licensing changes. The accident report form lacks details about vehicle characteristics (e.g. type of cargo, type of carrier) and does not relate especially to trucks and their peculiarities. The end result is that, given a poor report format, and that most police are not specialists in data collection, completion of the accident report seems too detailed and time-consuming for the investigating officer who must also control the accident scene, divert traffic and deal with possible injuries. Given these constraints, it is not surprising that researchers find the accident report data incomplete and unreliable and suspect that many witnesses may guess or distort the truth.

Level II investigations are more detailed. They may involve on-the-scene investigations by individuals with expert training, who know what to look for, and are not responsible for controlling the accident scene. They may make measurements, take photographs, examine vehicles for defects, assess the environmental and road conditions, and interview the people involved. Since there are usually more investigators at-the-scene than for Level I, more details can be observed in the time available and thus observations can be codefied for subsequent analysis. Post-scene vehicle examination and tests may be carried out where special equipment and more time is needed.

Level III investigations are the most intense and most detailed. All aspects of an accident are investigated, including the state of the vehicles and drivers and the environment prior to, during and after the accident. They frequently involve teams of experts including police officers and traffic engineers, medical practitioners, meteorologists and behavioural scientists. These studies are much more time-consuming and costly and may only be justified by the peculiar circumstances, frequency of occurrence or severity.

In the U.S.A., the Bureau of Motor Carrier Safety requires interstate trucking operators to submit a supplementary accident form for serious accidents. Serious accidents are defined as those involving fatalities, personal injury or property damage in excess of a specified dollar amount. Data not easily retrievable at the accident scene, such as load character and weight distribution, can be obtained. This supplementary information is useful both for the specific accident and for statistical analysis. Since many trucking companies already collect this information for their own purposes, requesting industry to complete this type of report should not constitute an excessive or unfair burden.

2.3.2. The O.P.P. have realized that more training is required for officers investigating accidents and to this end, are currently setting up a formal accident investigation course. The three-week course will be offered to O.P.P. officers for the first time in the summer of 1983 and will initially concentrate on functions involved in approaching the scene, at the scene, and post-scene investigation. Principles of heavy vehicle dynamics and mechanical defects may be included in the future as the course is evaluated and modified. One objective of the O.P.P. course is to develop an expert accident investigator in each district who can adequately analyze and reconstruct severe motor vehicle accidents.

A similar training program of greater technical sophistication is currently being conducted by the Royal Canadian Mounted Police. Their Technical Traffic Accident Investigation Course is offered through the Canada Police College in Ottawa and accommodates about twenty students. The first two sessions have been conducted in 1982, and three more are planned for 1983. This is an advanced accident investigation training program modelled after the well-respected Northwestern University course, and is intended for officers who have already completed formal basic courses such as that planned by the O.P.P. Topics covered include environmental considerations such as highway design, and vehicle defects, dynamics and damage. The course also includes photographic techniques, scale drawings, speed estimation, and presentation of evidence in court, with the intent of producing a graduate competent to conduct an accident investigation from beginning to end. The O.P.P. have been allotted one seat only for the course, due to limited enrolment, and one officer has already attended.

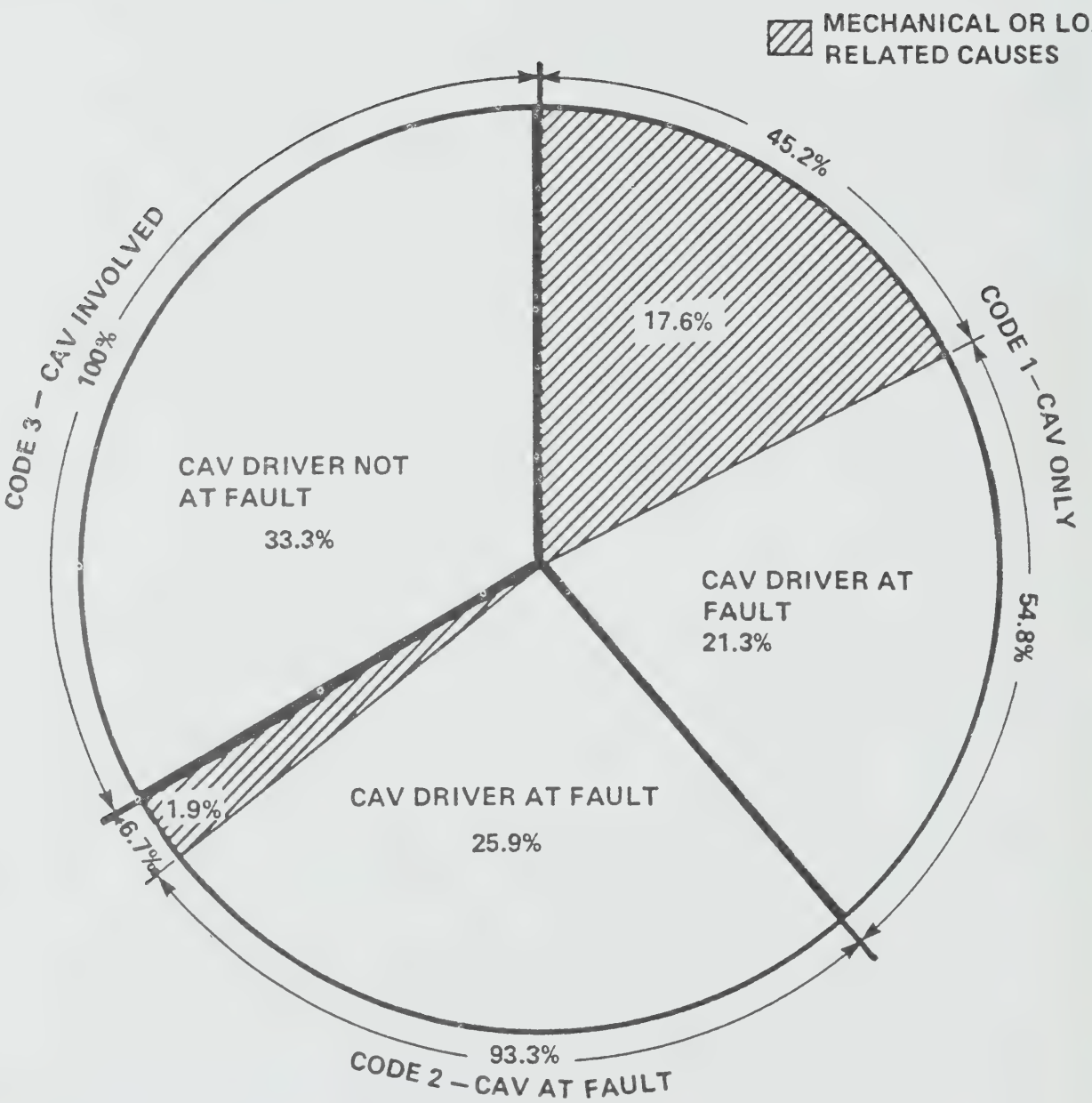
The police have an advantage over others in that they are present at all reportable accidents, and have authority to remove evidence and question persons involved so they have the best opportunity to evaluate what happened in the accident, before the wreckage is removed. It is expected that improvements to the accident investigation process at the basic level will result in more reliable and better quality data. In addition, officers will enhance their ability to act as expert witnesses in court, thus improving the chances of convicting persons who break the law.

For the past decade, Transport Canada has sponsored Multi-Discipline Accident Investigation teams at selected universities across the country. During the seventies, the university teams were contracted to make detailed investigations of the more severe motor vehicle accidents occurring within a specified radius of their home base. For example, the University of Toronto team concentrated on accidents in the Metro Toronto area, while that at the University of Western Ontario responded to police calls in the London area. The various team members combined their skills to generate very detailed information relating to all aspects of the particular accident under study, and the results of each accident investigation were published. Cost and time constraints limited the number of investigations to less than 200 per year nation-wide but by 1980, when the program was modified, approximately 1,000 cases had been investigated. Accumulated data from that project have since been sent to the Highway Safety Research Institute at the University of Michigan, and added to a file of similar M.D.A.I. study data from American sources.

In 1980 Transport Canada reduced the scope of accidents to be investigated by M.D.A.I. teams and streamlined the process of analysis. For the past two years, only accidents involving light trucks and vans have been chosen for sampling. The objective has been to study the nature of injuries to occupants of light trucks to determine what, if any, safety standards for passenger cars should be extended to light trucks, and the data collection process was improved by development and adoption of a standardized coding form. The light truck project is scheduled to be completed by the end of 1983 by which time more than 2,000 cases will have been accumulated for computer analysis. By early 1984, the next phase of the federal M.D.A.I. project is scheduled to begin and will sample accidents involving passenger cars. Transport Canada views an M.D.A.I. project dedicated to heavy truck accidents as being of lower priority than the forthcoming passenger car study, and is not currently planning a heavy truck project.

During the winters of 1980 and 1981, an M.T.C. skilled accident investigator was called in for most serious accidents in the Metro Toronto area involving commercial vehicles larger than 8200 kg. gross weight. (See M.T.C. Commercial Vehicle Accident Survey - an On-the-Scene Study, 1982). The purpose of this excellent study was to determine whether an on-the-scene investigation would provide a greater insight into the major causes and contributing factors of heavy vehicle accidents. Data regarding the vehicles involved and accident conditions were recorded and witnesses and investigating police officers were consulted for details when possible. Upon review of the information collected, each accident was reconstructed and conclusions as to probable cause and contributing factors were drawn. In total, 140 commercial vehicle accidents were investigated and the study was successful in providing insights into some of the causes.

FIGURE 3



% Distribution, Accident Causation Factors, MTC Survey Phase I & II

Source: Ontario Ministry of Transportation and Communications, Commercial Vehicle Accident Survey, 1982. Report RR 235

The study was able to distinguish between single and multiple vehicle accidents and to determine whether or not a Commercial Articulated Vehicle (C.A.V.) was responsible. See Fig. 3. The driver of the tractor-trailer (C.A.V.) was at fault in 47% of the accidents and either the driver or the truck in 67%. Only 20% were caused by mechanical failure or the load, and the drivers of the other vehicles were at fault one third of the time. This is alarming in view of the disparity in size between C.A.V.'s and passenger cars. The sample was small and there is a significant difference between the M.T.C. research results and the police accident reports, which attributed only 50% to the truck or its driver. Nevertheless, both figures seem very high for professional drivers who are supposed to be highly trained, driving vehicles which are supposed to be inspected regularly! The results must be considered preliminary and should be checked by further investigation.

The study also found that speeding too fast for the prevailing conditions was the single most frequent cause. Rollover accidents usually occur with heavily loaded trucks on dry pavement, but jack-knifing occurs with lightly loaded tractor-trailers on wet or slippery pavement. Another form of detailed accident investigation which is currently undertaken within M.T.C., involves post-accident analyses and reconstructions on an ad hoc basis. Safety experts are asked to evaluate serious accidents by using the police accident report as a starting point. Based on the report's content, the investigator may contact the officer, witnesses, the owners of the vehicles or the mechanic who inspected the vehicles. This approach generally concentrates on vehicle and road characteristics rather than on the driver.

2.4. THE COMMISSION RECOMMENDS THAT:

(1) The Ministry of Transportation and Communications should increase its efforts to collect, standardize, analyze and share truck accident data throughout Canada and the U.S.A. The research effort in identifying causes rather than involvement should be given the highest priority.

(2) The recent initiatives of the O.P.P. and the R.C.M.P. in the upgrading of police officers' skills in accident investigations should be encouraged and expanded so as to include more police from the larger urban centres like Metro Toronto.

(3) The M.T.C. and the O.P.P. should jointly design an Ontario Truck Accident Report, to supplement the existing accident report, and also establish the circumstances when the supplement should be required. In doing so, they should consult the insurance industry and the medical profession as well as trucking and automobile associations.

(4) The M.T.C. and the O.P.P. should jointly establish at least one permanent Multi-disciplinary Accident Investigation (M.D.A.I.) team for the purpose of investigating heavy truck accidents in Ontario. The operational control should remain with the O.P.P. but the experts could be drawn from other police forces, medical associations, universities and colleges, as well as from the staff of the M.T.C. This M.D.I.A. team should coordinate its operations and methodology with similar projects of Transport Canada for passenger cars and light trucks, especially when car-truck collisions occur. The M.T.C. and Transport Canada should cooperate in post-accident reconstruction and the synthesis of data, and the results should be made public.

CHAPTER III THE TRUCK DRIVER

3.1. Classified Driver Licensing System

3.1.1. The fact that driving is a privilege rather than a right is fundamental to any driver licensing system. The safety of the driver, other road users, and property, is a primary objective of the licensing system. Since it is generally agreed that the vast majority of truck accidents are caused by human error, the qualifications for, and the testing of, truck drivers are extremely important. According to Dr. W. Ghent of the Canadian Medical Association, "the operation of a motor vehicle is probably the most complex mental/motor endeavour in which we engage on a daily basis. The operation of a large truck compounds this complexity because of the potential for major disaster if the rig and its cargo are out of control" (C.M.A. Brief to the Commission, April 2, 1982). It is essential, therefore, that individuals who are entrusted to operate heavy trucks on Ontario's roadways possess adequate qualifications.

Prior to 1976, Ontario drivers could either be licensed as operators or chauffeurs, with the only distinction between the two classes being whether or not the applicant would drive for remuneration. A minimum vision standard and a basic knowledge of the rules of the road were required. Although usually road-tested in only an automobile or light truck, persons holding a chauffeur's licence could legally operate any size of vehicle, including buses and tractor-trailers. In 1977, with increasing numbers of drivers and vehicles, and in response to a need for higher driver qualifications, the Ontario Classified Licensing System was introduced. All other Provinces and Territories in Canada now have some form of classified licensing system. The purpose of Ontario's system is the establishment of minimum standards of driving ability and experience, and of medical and physical fitness, for drivers of different types and sizes of vehicles. It is also intended to help reduce the accident rates of young or inexperienced drivers.

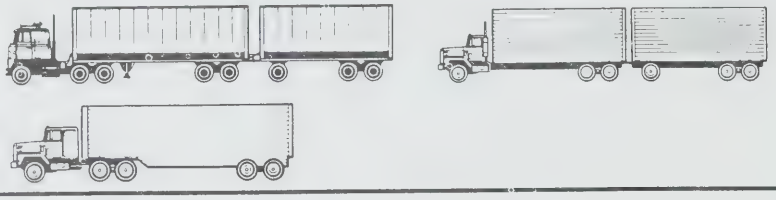
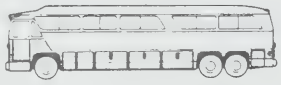
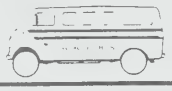
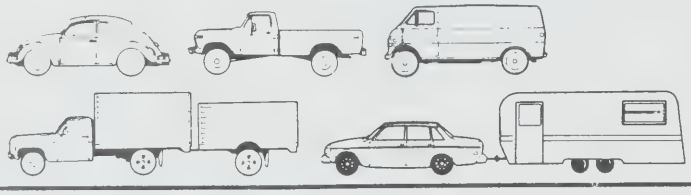
In the initial year of the Ontario system (1977), experienced commercial vehicle drivers were given the opportunity to convert their chauffeur's licence into an appropriate Class, without having to undergo written or road testing, by presenting an authorization by their employer or an affidavit. Only a medical report and vision test were required, but certain medical and vision deficiencies were temporarily waived as a means of reducing the sudden impact of the new licensing system,

There are ten classes of licences, each one specific to a certain type of vehicle. (See Fig. 3). A licence holder may possess a single class or certain allowable combinations of classes. For example, Class A holders may also drive vehicles in Classes D and G, while Class D holders may also drive vehicles in Class G.

FIGURE 4

ONTARIO
CLASSIFIED DRIVER LICENSING SYSTEM
QUICK CHECK CHART

INTENDED AS A GUIDE ONLY
FOR OFFICIAL PURPOSES REFER TO THE ONTARIO HIGHWAY TRAFFIC ACT

CLASS OF LICENCE	TYPES OF VEHICLES ALLOWED	MAY ALSO DRIVE VEHICLES IN CLASS
A	ANY TRACTOR-TRAILER OR TRUCK-TRAILER COMBINATION 	D AND G
B	ANY SCHOOL PURPOSES BUS 	C, D, E, F AND G
C	ANY REGULAR BUS 	D, F AND G
D	ANY TRUCK OR COMBINATION PROVIDED THE TOWED VEHICLE IS NOT OVER **4600 kg** 	G
E	SCHOOL PURPOSES BUS – MAXIMUM OF 24-PASSENGER CAPACITY 	F AND G
F	REGULAR BUS MAXIMUM OF 24 PASSENGER CAPACITY AND AMBULANCES 	G
G	ANY AUTOMOBILE, SMALL TRUCK OR COMBINATION UP TO **11,000 kg** PROVIDED THE TOWED VEHICLE IS NOT OVER **4600 kg** 	
M	MOTORCYCLES 	
L	VALID FOR THE OPERATION OF A CLASS G MOTOR VEHICLE WHEN ACCOMPANIED BY A HOLDER OF A VALID CLASS 'A, B, C, D, E, F OR G' LICENCE, OCCUPYING A SEAT BESIDE THE 'L' LICENCE HOLDER, FOR THE PURPOSE OF GIVING INSTRUCTIONS IN DRIVING THE MOTOR VEHICLE.	
R	VALID FOR THE OPERATION OF A MOTORCYCLE, SUBJECT TO THE FOLLOWING CONDITIONS: – VALID FOR ONE HALF HOUR BEFORE SUNRISE TO ONE HALF HOUR AFTER SUNSET – NO PASSENGERS ALLOWED – NOT VALID FOR HIGHWAYS WITH SPEED LIMITS IN EXCESS OF **80 km/h** EXCEPT HWYS. 11 & 17	

NOTE
- ALL CLASSES OF LICENCE AUTHORIZE OPERATION OF A MOTOR-ASSISTED BICYCLE OR MOTORIZED SNOW VEHICLE
- THE HOLDER OF A CLASS M LICENCE MAY OPERATE A CLASS G VEHICLE WHILE RECEIVING INSTRUCTION AND ACCOMPANIED BY A PROPERLY LICENCED DRIVER
- A PERSON MAY HOLD A SECOND DRIVER'S LICENCE ONLY WHEN THE SECOND LICENCE IS A CLASS R MOTORCYCLE LEARNER LICENCE
- AN APPLICANT FOR A CLASS B OR E LICENCE MUST BE A GRADUATE FROM A DRIVER IMPROVEMENT COURSE

Source: Ontario Ministry of Transportation and Communications

Class A (tractor-trailers) allows the holder to drive any motor vehicle or combination of a motor vehicle and towed vehicles.* Any combination with towed vehicles in excess of 4600 kg. total gross weight requires an A licence. The minimum requirements are that the applicant must be 18 years of age; be the holder of a valid Ontario Class G or higher driver's licence or equivalent; meet vision standards and provide a satisfactory medical report. The candidate must pass a written test of operating knowledge of large trucks and tractor-trailers and pass an on-road test demonstrating driving ability in a sufficiently large tractor-trailer combination.

Class D (straight trucks with or without small trailers) allows the holder to drive any motor vehicle or combination of a motor vehicle and towed vehicles provided the towed vehicles are not over 4,600 kg. gross weight.* Any motor vehicle in excess of 11,000 kg. total gross weight requires a D licence. The minimum requirements for application are similar to those of Class A shown above, except that a medical report is not required periodically and the tests concern large straight trucks rather than tractor-trailers.

Class G (passenger cars, vans, pick-ups, with or without small trailers) allows the holder to drive any motor vehicle not over 11,000 kg. gross weight, or combination of a motor vehicle and towed vehicles provided the motor vehicle is not over 11,000 kg. gross weight and the towed vehicles are not over 4,600 kg. gross weight.* The minimum requirement for application requires an age of only 16 years with parent's or guardian's signed consent, 17 years otherwise. The tests concern the ability to drive and an operating knowledge of small trucks or passenger cars plus adequate knowledge of the laws and rules of the road.

There are some glaring deficiencies in the current Ontario classified licensing system. For example, it is not clear why bus drivers should automatically be allowed to drive heavy straight trucks as they are now. The weights and operating characteristics of some Class D trucks are vastly different from those of buses and, despite the fact that bus driver applicants are tested on some aspects of straight truck operation, they should have to obtain a Class D licence before being allowed to drive them. In addition, a Class G licence allows its holder to operate some rather large combinations of trucks with trailers and it is doubtful that a Class G holder has the knowledge, ability or experience to handle such vehicles.

* Excluding a bus carrying passengers, motorcycle or ambulance in the course of providing ambulance service.

The minimum requirements for bus licences are in some ways more stringent than those for the heavy truck classes. Applicants and holders of licences for any size bus must pass hearing standards which are not required of the truck classes. In addition, applicants for school bus licences must be at least 21 years of age, must have successfully completed a Driver Improvement Course, and satisfy several requirements relating to their past driving records. There may be merit in extending to the heavy truck licence classes similar requirements. Alternatively, stricter licensing of heavy truck drivers could be achieved through expansion of Ontario's probationary licence system. (See Sec.3.1.

3.1.2. The skill and knowledge required to pass an M.T.C. driver licence test, even for the A class, are only the minimum levels of proficiency. The Commercial Vehicle Driver Performance Improvement study (DelCan, 1981) noted that the industry requirements of drivers bear little relation to the standards required to pass the licensing test in any province. The truck driver must first pass the government testing program in order to gain a licence and then further tests are often prescribed by the employer. Industry testing varies considerably in sophistication according to the type and size of individual trucking companies. Smaller carriers generally must rely on the testing administered by the licensing authority while large carriers often apply their own well developed testing procedures to all driver applicants. The U.S.A. Large Truck Accident Causation study (N.H.T.S.A. 1982) reported a similar two-phase testing procedure. Company requirements typically are found to include: personal background and driver record checks; medical certification; road testing; and a written examination, often of a more stringent nature than required by licensing authorities. Each province of Canada has different standards, both for written and practical tests, which makes reciprocity difficult. The U.S.A. Department of Transport is at present involved in the development of a standard licensing test for all states.

The O.T.A. commented that both the written and practical tests appear to be too lenient." According to the O.T.A., three primary objectives of truck driver testing should be: to screen out applicants who lack a level of knowledge and skill acceptable to the industry; rigorous enough to have forced an applicant to complete a formal training program; and comprehensive enough to encompass the wide range of skills and knowledge that a driver requires. The O.T.A. further recommended that testing should only be carried out by licensees of the Provincial government.

Each applicant for an Ontario driver's licence must successfully complete a written examination of the traffic laws and good driving practices relating to the vehicle licence class beihg sought. The Ontario driver's manual entitled: The Driver's Handbook is a basic guide which describes traffic signs and markings, rules of the road and good driving practices. The material covered in that booklet is of very good quality and should be studied in prepa-

ration for the written examination of all classes of licence. The School Bus Manual and the Truck and Bus Driver's Manual cover the additional material required for these classes. The Truck and Bus Driver's Manual sets out the information that Class A and D applicants require, plus the various skill tests they will be expected to perform during a driving test. The booklet contains sections on vehicle inspection, mechanical systems, driver responsibilities and other related matters, but it was not intended to be a complete training manual. The O.P.P. noted that the Truck and Bus Driver's Manual does not cover the dynamic handling characteristics of various truck types, multiple combinations, air-brake theory, maintenance and usage, preventative maintenance, and specific regulations such as security of loads, tires and vehicle safety. The O.P.P. recommended that the manual should be rewritten and the driver examinations be made more comprehensive.

Class A licence holders in Ontario are required to pass a written examination every three years until the age of 65, and annually thereafter, but Class D and G licence holders are not normally required to complete written examinations until they reach the age of 80. Thereafter, annual examinations are required. However, any driver over 70 years of age found to be at fault in an accident, or of any age who is found to be at fault in at least two accidents during a 3-year period, is required to pass a complete re-examination. The written examinations of most provinces are more comprehensive than Ontario's.

In addition to the written examination, there must be a practical test so the examiner observes the applicant's ability to handle his vehicle on the road and completes a Record of Driver Examination. The road test for heavy truck applicants lasts somewhat over an hour and covers about ten miles. It consists of a pre-trip inspection followed by operation of the vehicle in traffic. Class A applicants may also be required to uncouple and couple the units forming the combination vehicle. Class A licence holders are required to pass a road test annually after age 65, but Class D and G licence holders only when they reach age 80.

The importance of the pre-trip inspection cannot be over-emphasized because of the potential danger of unsafe operating equipment. Many trucking organizations and individual carriers across North America have developed sophisticated requirements for pre-trip vehicle inspections as part of their driver manuals.

In Ontario, it is currently possible for a Class A applicant to take the practical road test, using a vehicle with significantly different operating characteristics from a typical tractor-trailer. For example, a pick-up truck in combination with a trailer unit in excess of 4,600 kgms. may be used legally by the applicant for the Class A road test. This is inadequate and should be prohibited.

The O.T.A., in its June 1982 submission to the Commission, recommended that the current classification system for drivers of heavy trucks be modified and that there should be:

(a) a separate licence class for drivers of truck combinations having more than one point of articulation,

(b) a separate class for any truck having a single point of articulation

(c) a separate class for any straight truck with a cargo body length of 4.9 meters (16 feet) or more.

The O.T.A. feels that multiple combination truck drivers must have distinct skills and a different attitude, and believe that a separate licence class is warranted. Similarly, the O.T.A. believes that the present Class D licence should be modified so as to be based upon a cargo body length rather than the current weight criteria. Each of the three new truck driver classes proposed above would be subject to various requirements of experience and driving record, completion of a Driver Improvement Course, and medical retesting. The Commission believes it should be possible to accomplish the same results by using "endorsements" to the existing classifications.

3.1.3. The idea of requiring drivers of vehicles equipped with specialized equipment to hold an "endorsement" additional to their licence classification has been gaining acceptance. An endorsement can be indicated directly on the driver's licence to show that he is qualified to operate special vehicles. By making use of the endorsement system, licensing authorities can minimize the number of driver licence classes while still matching driver skill with vehicles of different operating characteristics. Two vehicle types have been identified as warranting consideration:

(a) any vehicle equipped with an air-brake system,

(b) any multiple trailer combination.

It is now well accepted that the operation of air-braked vehicles is significantly different from those with conventional hydraulic brakes. Persons expected to drive air-braked vehicles must have proper knowledge of all the components of the system including valves and gauges. The driver should be aware of the peculiar aspects of air-brake systems such as time lag and the air reservoir depletion which results from pumping the brakes. Because of its rugged terrain, B.C. was the first province to implement the air-brake endorsement, and is recognized as the leader in this area.B.C. examiners who test applicants have themselves completed an approved air-brake course. Four other provinces, which have since adopted the air-brake endorsement, have based their programs on the B.C. system.

Inspections by O.P.P. officers have indicated that 30% of all trucks on Ontario roads have air-brake defects so the O.P.P. recommends that Ontario

implement an air-brake endorsement program similar to the B.C. system. Daily maintenance and testing by the driver is especially important in Southern Ontario due to extreme and rapid weather variation which can lead to condensation and freezing in the system. The O.P.P. further recommends that questions on air-brake theory, operation, maintenance and service be included in the written tests for truck drivers. The O.T.A. also recommended an air-brake endorsement, regardless of licence class held.

As with air-brakes, the use of multiple trailer combinations is becoming more widespread and it is felt by many that special skills are required for drivers of these units. (See Fig. 6). The Ontario Petroleum Association stated that "certification for multiple units or other units that may require specific skills or training would be useful to ensure drivers have received the necessary basic training". The operation of multiple trailer units is more demanding than single trailer units because of the existence of more than one point of articulation. This leads to greater instability, weaving motions and greater possibility of rear trailer rollover, especially in emergency manoeuvering. The coupling of a multiple trailer unit is more involved because there are extra connections for air lines and cords between the trailers and between tractor and lead trailer. The sequencing of air valves for the entire combination must be correct.

Double trailer combinations which use a converter dolly (i.e. "A trains") have three points of articulation, thereby increasing the possibility of separation of the trailers and causing greater instability in comparison to "B trains". (See section 4.1.2.). The added operating complexity depends on whether the combination is an A or B train. The driver of a multiple combination should avoid situations where backing would be required as trains are extremely difficult to back up. The driver should also be aware of the fact that the heavier trailer should always lead the lighter trailer in order to achieve increased stability.

3.1.4. There exist wide variations between provinces and states in licensing requirements and the variation between different states in the U.S.A. is even greater than is the case between provinces in Canada. Many American states have not yet adopted a classified driver licensing system and, as a result, many out-of-province truck drivers may be less than suitably qualified in their ability to handle their vehicles safely. Nevertheless, through reciprocity agreements, Ontario recognizes driver's licences issued by other provinces and states. Persons holding a licence issued by any Canadian province may exchange that licence for a corresponding class of licence in Ontario. However, American truck drivers are required to complete the entire testing process: medical, vision, written and practical. Reciprocity is beneficial only if the licensing standards are not significantly inferior to Ontario standards; therefore Ontario should continue to support and participate in efforts to standardize North

American requirements. The N.H.T.S.A. is currently considering an improved testing procedure called the Truck Operator Qualifications Examination (T.O.R.Q.U.E which is being prepared by the U.S.A. National Public Services Research Institute. The objective is to develop a standard test which could be used by all states. The results should be available toward the end of 1983 and should be monitored closely by the M.T.C.

The problem of truck drivers holding multiple licences has developed because driver licensing is a provincial/state matter. By holding more than one licence, unsafe drivers having many violations or accidents may circumvent suspension of driving privileges. The problem of multiple licence holders is probably more widespread in the U.S.A. than in Canada simply because there are more states than provinces. The Commercial Vehicle Driver Performance Improvement study by DelCan 1981, states that the trucking industry and the Canadian Conference of Motor Transport Administrators are in favour of establishing a Canadian central registry as a source of driver licence information. At present, the Canadian Police Information Centre collects these data, but retrieval is difficult.

In the U.S.A., the National Driver Register (N.D.R.) is a federal file of drivers whose licences have been revoked or suspended. State licensing authorities may check the N.D.R. file when drivers are granted or renew their licence, to make sure that individuals with unacceptable driving records are not given a licence. The N.D.R. was established in 1960 and is maintained by the N.H.T.S.A. However the usefulness of the system has been limited by the time required to send requests to Washington and to obtain a response through the mails. States with same-day licence issuing have therefore not been able to benefit from the N.D.R. so it has recently been proposed that the register's computer network be upgraded to allow on-line response to requests. Because of a requirement to cut the budget, and because some states were not participating, the N.H.T.S.A. temporarily recommended elimination of the N.D.R. program, but was quickly forced to change its position because of strong reaction from citizens' groups concerned with road safety.

3.1.5. Ontario has a Driver Certification Program under which fleet operators and Colleges of Applied Arts and Technology (C.A.A.T.) may certify the driving ability of their own drivers or students, and issue certificates of driving competence. Such certificates are accepted in lieu of M.T.C. driving tests for all classes of licences except the basic Class G. To become a Recognized Authority, a fleet operator must establish and maintain a training and testing program which is acceptable to the M.T.C. and which includes: a road test; instruction and examination by a qualified driver trainer who has been issued signing authority and the maintenance of records which may be audited by the M.T.C. Similarly,

C.A.A.T.S. may become Recognized Authorities and have signing authority. There are over 200 Recognized Authorities with a total of about 500 signing authorities in Ontario at present, who certify about 5000 drivers annually. Some Récognized Authorities have also been granted the right to conduct the vision tests, provided the equipment used is approved by the M.T.C. For example, the Toronto Transit Commission is approved to conduct the entire testing program.

The Driver Certification Program has been successful because it is in the interest of the fleet operator or college to maintain Recognized Authority status and a high reputation. It is a means by which trucking companies with large fleets may screen out undesirable candidates and select only those who are likely to develop into safe and responsible drivers. M.T.C. is currently considering extending the Driver Certification Program to private truck driver training schools. The private schools would be invited to participate in the program, provided that they agree to meet the training standards as for C.A.A.T.S. It is not clear to what extent the private trucking schools will be willing to participate, because of the costs involved.

3.1.6. Ontario maintains a Probationary Driver System. Under this system, probationary status applies to all newly licensed drivers regardless of age. Probationary status applies for a minimum of two years. According to the M.T.C. Driver's Handbook, the driver must complete two 12-month probationary periods without having any traffic violations which result in the licence being suspended. If a probationary driver receives a total of six demerit points, the licence will be suspended and will not be reinstated until 30 days have elapsed.

The purpose of this probationary system is to help reduce the high percentage of traffic violations and accidents involving new drivers. The U.S.A. Large Truck Accident Causation study (N.H.T.S.A. 1982) reported that drivers of large trucks under the age of 25 exhibit a much greater safety problem than passenger car drivers of the same age range. In fact, truck drivers under 25 were about six times more likely to be involved in an accident than would be expected for their share of the total truck driver population. The O.T.A. also recognizes the high accident record of young and inexperienced drivers.

Eligibility to obtain any higher class licence than the basic Class G should be prohibited for new drivers who are still under probation. Only when Class G holders have successfully completed their two-year probationary term should they be eligible for a Class D licence. New Class D holders could also be placed on a two-year probationary period. They could be subject to being temporarily down-graded upon accumulation of six demerit points, and would have to complete two 12-month probationary periods. Similarly, only Class D licence holders who have successfully completed their probation would be eligible for a Class A licence. In order to achieve probationary-free status, the

Class D licence holder could be required to complete an approved straight truck training course. Similarly, completion of a tractor-trailer training course could be a necessary requirement for Class A holders. Such a probationary program of progression from operating light trucks to heavy trucks, to articulated combinations, allows the orderly development of a driver's ability. This procedure would prevent very young or inexperienced drivers from being allowed to drive heavy trucks, particularly tractor-trailers. A new driver wishing to obtain an unconditional Class A licence would require a minimum of six years under such a system unless he/she opted to take an approved driver training program.

3.1.7. Although the length and content of the practical tests given for tractor-trailer applicants appear to be similar across provinces, there are major differences in the qualifications of the examiners. In most provinces, including Ontario, examiners must successfully complete a specified training course, but are not required to hold the class of licence for which they are testing the applicant. Saskatchewan and Manitoba do require their examiners to hold the class of licence for which the applicant is being tested.

At present, a driver examiner must meet the following requirements: have a high school education; be at least 25 years of age; have a sound knowledge of the Highway Traffic Act (H.T.A.) and its regulations; be in good physical condition; and possess good communication and public relations skills. At the Ontario Police College in Aylmer, Ontario, the examiner recruits are given intensive training in the H.T.A., the vehicle types in which they will be expecte to road-test, and an assortment of public relations courses, in a 60-hour program administered by the Chief Instructor. Study of the mechanical systems such as air brakes and gearings which are peculiar to the heavier type vehicles is included. The newly-trained examiner is then sent to an examination centre to gain experience and observe experienced examiners administer on-road tests. Although the M.T.C. examiners attend meetings and workshops in order to keep abreast of changes, there have been criticisms of inconsistency between testing centres and between individual examiners, so the M.T.C. should promote efforts to standardize the competence of driver-examiners and the criteria they use in examinations.

3.2. Training and Education

3.2.1. Aspiring truck drivers may receive only casual training from a variety of sources including relatives and friends. In Ontario, candidates are not required to complete any formal driver training and they are not required to meet any minimum level of formal education. To become a truck driver, they are required only to meet the minimum prescribed standards for a Class D or a Class A licence. The path followed by most entrants into the trade is first to obtain a Class G licence, which permits the driving of any small straight truck up to 11,000 kg., and then a Class D. It is at this point that the informal training starts to break down. The leap from cars to small trucks to middle-size trucks is small compared with the leap to heavy trucks using air brakes. Nothing in their previous informal training has prepared the individual for the skills required. The gap between a Class D and a Class A licence is wider still. The driver must learn about non-synchro-mesh transmissions, a new set of engines and new set of vehicle dynamics. At this point, informal training fails completely and outside help is needed to learn to drive articulated combination vehicles.

In Ontario, formal truck driver training can be obtained at ten Colleges of Applied Arts and Technology (C.A.A.T.) and eight Private Vocational Schools (P.V.S.) as well as in-house from fleet owners who are Recognized Authorities. There exists a Provincial Consultative Committee on Truck and Tractor-Trailer Driver Training which recommends the performance objectives for straight truck and tractor-trailer drivers which have become the guidelines used by the M.T.C. Both the C.A.A.T.'s and the P.V.S.'s are regulated by the Ministry of Colleges and Universities. The colleges are funded by the M.C.U. and through vocational training grants from agencies like Canada Manpower. Under the Private Vocational Schools Act, the private truck driver schools must be registered and must post a bond with the M.C.U. The facilities are inspected biannually by the M.C.U. and the schools must meet regulations governing course content, duration, instructor's qualifications, tuition fees and certificates. The P.V.S.'s are very competitive and profit-oriented and, because they are not subsidized, they must charge the full cost of driver training to their students. Both the P.V.S.'s and the C.A.A.T.'s accept students sponsored by: the Worker's Compensation Board, the Department of Correctional Services, Social Services, Vocational Rehabilitation and Canada Manpower, as well as fee-paying individuals.

The admission requirements for the M.C.U. straight truck training program are simple. The applicant must be 18 years of age or more, hold a valid Class G licence, have one year of driving experience, pass the medical requirements for a Class D licence and have a working knowledge of one of the two official languages in Canada. The guidelines require a minimum of 90 hours

of training but the course length depends on the student's ability and performance. As the main emphasis of this training is on driving, the student must be provided with a minimum of 30 hours of behind-the-wheel experience under varying traffic conditions.

The tractor-trailer guidelines require the student to have a minimum of 120 hours of training of which a minimum of fifty hours of driving experience must be in normal conditions of traffic. Twenty-five hours behind the wheel must be spent on public highways and city streets between 8.00 a.m. and 8.00 p.m. under varying traffic conditions.

At the Commission's Public Hearings, many of the interest group representatives, including insurance companies, the trucking industry and private training schools, drew attention to the wide variations in curricula and their duration. The M.T.C. was criticized because the actual courses may fall short of the guidelines and the M.T.C. does not enforce them adequately. It was recommended that the minimum course curriculum be standardized and expanded, and the minimum duration be increased. The O.T.A. has recommended that the straight truck program be a minimum of 120 hours with on-road and training yard manoeuvering a minimum of ninety hours, and their recommended tractor-trailer program includes a minimum of 150 hours, with on-road training and yard manoeuvering a minimum of 120 hours.

3.2.2. In 1979 Transport Canada initiated a multiphase project entitled Commercial Vehicle Driver Performance Improvement (C.V.D.P.I.) Phase I was completed in March 1981 and involved a study by DelCan of various means of improving commercial vehicle driver performance.

The C.V.D.P.I. report also noted that there are substantial differences between the standards and quality of material taught, instructor qualifications, and facilities and equipment employed by C.A.A.T.'s and P.V.S.'s. Phase II is under way and a report is due in 1983 from the consultant which will include an examiner's manual.

In 1976 the U.S.A. B.M.C.S. proposed screening procedures and very comprehensive and detailed curriculum requirements for both straight truck and tractor-trailer training. The requirements would go far beyond the present guidelines of the Ontario M.T.C.

Under the Ontario Occupational Health and Safety Act and the Canada Labour Code, all employees in Ontario have the right to refuse to operate a vehicle which is unsafe, so truck drivers should have sufficient knowledge to be able to recognize mechanical or other safety defects. Vehicle inspection should be an important part of the truck driver training program. The trainee should be taught how to recognize critical defects through a well-practised

check sequence (see Section 4.3.) and student truck drivers should be taught basic preventative maintenance. This type of training would enable the driver to make minor repairs while on the road. However some companies require maintenance or repair work to be done by a union mechanic.

3.2.3. It is widely recognized that the effectiveness of training can depend to a great extent on the skill of the instructor. The C.V.D.P.I. report by DelCan noted that training of instructors varies significantly from school to school. Many driving schools employ persons who have had no formal training, either as commercial vehicle operators or in how to teach. In no case does the training of instructors approach the extensive training that a school teacher receives. Truck driver training instructors should be both skilled drivers and knowledgeable in teaching techniques but, at the present time, there is no standardized, comprehensive course designed specifically to train them. It is generally agreed that instructors should hold a valid driver's licence in the class of vehicle being taught, and have had good experience driving trucks. Under the Private Vocational Schools Act, private training school instructors are required to have some university or college training, or a minimum of four years driving experience. Colleges of Applied Arts and Technology instructors are required to be Teaching Masters and serve a two-year training apprenticeship at the College which includes the successful completion of an in-service training program. This type of instructor training is generally not available to the industry as a whole.

While there is consensus that a training program for instructors is desirable, there is little agreement on the ideal training program's content, duration or approach! The Ontario Highway Traffic Act defines "driving instructor" merely as a person who teaches others to operate motor vehicles and "receive compensation therefor". The Lieutenant-Governor-in-Council "may make regulations licensing, regulating and governing driving instructors and the teaching of persons to operate motor vehicles". So far, only instructors who teach Class G are required to be licensed by the M.T.C. under that Act. Class G motor vehicle driving instructors are required to meet prescribed standards in the following areas: age, medical condition, driving record, demonstrated ability to operate a Class G motor vehicle, and criminal record. In addition, the driver instructor applicant must submit a certificate of competence signed by a Chief or Master Driving Instructor which denotes the successful completion of an M.T.C. approved course.

Chief Driving Instructors are those who have successfully completed an M.T.C. approved Chief Driving Instructor's course at a C.A.A.T. Eligibility requirements include those for driving instructors plus five years experience. Chief Driving Instructor courses must be taught by a Master Driving

Instructor. A Master Driving Instructor is a person who meets the following M.T.C. requirements:

(a) holds an Ontario Teaching Certificate,

(b) has completed a teacher preparation course at a university,

(c) has five years experience as a licensed driver instructor,

(d) has been recommended by a Director of Education as a person capable of teaching other teachers,

(e) has requested the status of Master Driving Instructor in a letter to M.T.C.

3.2.4. The Commission has been told that professional truck drivers need advanced driver training beyond the requirements for a Class D licence. These are often referred to as defensive driving, emergency driving or advanced driver training. Generally the larger fleets have ongoing driver safety programs but many of the smaller trucking firms and owner-operators have no safety programs. There are no standards for these in-house programs. A number of truck fleet operators do provide defensive driving courses developed by the Canada Safety Council. Their Professional Driver Improvement Course (P.D.I.C.) is an eight-hour classroom course that identifies driving strategies and techniques to prevent collisions. The course includes information on safe following distances, driving in adverse weather conditions, load distribution and security, tire care, vehicle instability, driver fatigue, and much other safety information. The course has been available since 1976 and is offered in Ontario by the Ontario Safety League, several community colleges and trucking firms. The P.D.I.C. course is given by qualified, registered instructors and is generally available at very low cost. At present Alberta, Prince Edward Island and Nova Scotia require drivers with suspended licences to undergo a defensive driving program and in Alberta, truck drivers with point deductions must take a P.D.I.C. A trucking company may employ a recognized P.D.I.C. instructor to give the course to their drivers or have an instructor trained by the Canada Safety Council and Ontario Safety League.

While defensive driving can be taught inexpensively and practised frequently, emergency skills usually require an expensive driving range and skid pad to rehearse appropriate responses under a variety of adverse situations. Because emergency situations are relatively infrequent, the opportunity for a truck driver to practise and maintain these skills is limited and their effectiveness without periodic retraining is suspect. Emergency or advanced driver training courses are intended to provide the driver with a better understanding of his and the vehicle's capabilities and limitations; inappropriate braking, steering or acceleration; and the required reactions in critical situations. It is felt that the truck driver should have "hands on" understanding of the effect of vehicle dynamics, driver action and environmental factors, in order

to react appropriately to a potential accident. Emergency driving skills differ from the skills needed to operate a truck under normal road, weather and traffic conditions, and should only be used during critical situations to prevent or reduce the severity of an accident.

Advanced driver training is usually only taught to police, fire fighters, ambulance drivers and a small group of private fleet operators such as Bell Canada and the Toronto Transit Commission, and requires special facilities such as those of Transport Canada at Blainville, Quebec. The Ontario Ministry of Health requires all Ministry ambulance officers to take an Emergency Vehicle Operators' course. The course includes training in skid prevention and control, evasive vehicle manoeuvers, steering and controlled braking.

3.2.5. Little is known of the special perceptual, judgmental and physical skills necessary for the safe handling of multiple trailer combinations, nor if these skills can be taught. The accident data do not provide adequate information on the causes of multiple trailer combination accidents. The recently published U.S.A. N.H.T.S.A. report: Larger Truck Accident Causation (1982) concludes that "available evidence is conflicting on whether or not the accident rates per mile of travel differ between single-trailer and double-trailer combination trucks. Combination trucks, especially double trailer combinations, appear to have higher accident rates when running empty or near-empty than when running loaded". The special knowledge or skills required to operate multiple trailer combinations are due to the different handling characteristics, manoeuverability and stability. The performance objectives recommended by the Ontario Provincial Consultative Committee include description of the differences between truck and multiple-trailer combinations, but there are no requirements for on-the-road training.

3.2.6. Because simulators are widely used in the pilot training programs of the large commercial aircraft industry, it has been suggested that they should also be used for elementary and advanced truck driver instruction. These simulators are very sophisticated but, surprisingly, they are not yet sophisticated enough to cope with the very short times or the large variety of external influences and cues to which the truck driver must respond to avoid an accident. While simulators are used to train novice drivers in normal vehicle handling, it is unlikely that the large number of different emergency situations could be replicated. The potential usefulness of this type of training may be limited to periodic retraining because the emergency skills are required infrequently in normal driving. Simulator training is most effective in developing habitual responses, which may not be appropriate in emergency situations. R.F. Stapells and Associates Ltd. conducted an investigation of simulators on behalf of the Transport Canada

Research and Development Centre in 1977, to determine the degree of complexity required for a simulator to be more effective than present training methods. They found that there was a consensus among operators on the need to provide emergency training for bus and truck drivers but there was no consensus as to what situations need to be simulated, nor what maximum cost could be tolerated. Also the DelCan C.V.D.I. Report noted that simulators are used for training in numerous organizations and range from extremely basic static devices to complex machinery which simulate vehicle noise, vibration and accelerations. In almost all cases, however, the consensus appears to be that the usefulness of simulators is limited to training novice drivers the basic skills of operating a vehicle such as gear shifting, location of gauges, etc. DelCan concluded that "except for the teaching of basic driving skills to novice drivers, simulators have shown little positive benefit, and it seems unlikely that they are worth pursuing as a cost-effective means of training commercial vehicle drivers".

3.3. Medical Requirements

3.3.1. Medical standards adopted for the Classified Licensing System were essentially those recommended by the Canadian Medical Association (See: Guide for Physicians in Determining Fitness to Drive a Motor Vehicle, 1977). Similarly, vision standards were jointly recommended by the Canadian Ophthalmologist Society and the Canadian Association of Optometrists. The medical requirements for each class of licence are those necessary to meet the physical abilities demanded for the safe operation of different types and sizes of vehicles. Each applicant for a Class A licence must submit a medical report which satisfies the requirements set out in Regulation 462 under the Highway Traffic Act, every three years or at the request of the Ministry (see Appendix IV). A vision screening test is also required every three years but when the licensee reaches 65 years of age, he is required to file a medical report and pass the vision test yearly. Class D are currently required to submit a medical report at the request of the Minister. Holders of a Class A licence who develop a medical condition or who fail to submit a satisfactory medical report are downgraded to a lower class.

The medical qualifications required for a Class A or D driver's licence are, in abbreviated form, that the applicant or holder:

(a) has no physical impairment likely to interfere with safe driving,
(b) has no diagnosis of diabetes that requires insulin,
(c) is not taking any drug in dosages that could impair his driving ability,
(d) has no medical history of blood clots.
(e) has no medical history of heart or respiratory disease,
(f) is not suffering from an aortic aneurysm,
(g) is not suffering from hypertension resulting in giddiness,
(h) has no established medical history of loss of consciousness,
(i) has no established medical history of a disorder of the musculo-speletal or nervous system,
(j) has no established medical history of hostile, aggressive, paranoid, suicidal or other destructive tendencies,
(k) has a visual acuity by Enellen Rating, with or without the aid of corrective lenses, no poorer than 20/30 in the better eye and 20/50 in the weaker eye, and
(l) has a horizontal visual field of at least 120 degrees in each eye.

The condition described in (d) does not disqualify a person for a Class D driver's licence where it is medically determined that a full recovery has been accomplished and there is no medical history of a second occurrence.

The C.M.A.'s Guide for Physicians in Determining Fitness to Drive a Motor Vehicle was originally developed only as an aid to practising physicians but with the adoption of classified licensing systems across Canada, all provinces,

including Ontario, enacted legislation based on the C.M.A. guide. The statements expressed in the Fitness to Drive Guide represent the considered opinion of the medical profession of Canada and Ontario, and the medical standards are in keeping with those in the U.S.A., Great Britain and Australia. Given that no evidence has been put forth to challenge the C.M.A. positions, the guidelines form a valid basis for Ontario's driver medical requirements. However, Ontario has chosen to disregard certain recommendations made by the C.M.A. and O.M.A. For example, commercial truck drivers who have developed heart conditions have in some cases been allowed to retain their class of licence (through the medical waiver process) despite the fact that the condition in question warranted downgrading according to the C.M.A. Until such time as the C.M.A. recommendations can be refuted through research and proper testing procedures, the O.M.A. and C.M.A. consider government deviation from their recommendations to be irresponsible. In other words, the C.M.A. position is that, since we don't have the benefit of conclusive evidence, society's best alternative is to accept the collective opinion of the medical profession.

The C.M.A. Fitness to Drive Guide recommends that truck drivers should be required to submit a medical report according to the following schedules:

(a) Class A: at time of application, every 5 years to age 45, every 2 years to age 65 and annually thereafter.

(b) Class D: at time of application, at age 45, every 5 years to age 65 and annually thereafter,

(c) Class G: at age 70, every 2 years to age 80 and annually thereafter.

The C.M.A. contends that adequate hearing is essential for drivers of heavy trucks. Ontario has adopted the C.M.A. hearing standards for bus drivers, but not for truck drivers.

3.3.2. The O.T.A. supports Ontario's current truck driver medical standards because they have been developed from recommendations made by the medical profession, but they believe that medical examination should be cyclical and that all truck drivers should be re-examined every two years. However the Teamsters Joint Council, in their September 1982 Submission to the Commission, said that regulations regarding medical requirements were satisfactory, and sspecifically recommended that "regulations affecting a driver's ability to retain a Class A driver's licence remain unchanged". The Provinces of British Columbia, Manitoba, New Brunswick, Newfoundland, the two territories have adopted medical re-examinations more closely corresponding to the Canadian Medical Association guidelines than has Ontario, at least for classes of licences which allow for the operation of tractor-trailers.

There is concern that personal physicians are, in many cases, not repor

ing medical conditions of patients which should be reported. The problem may be caused by the fear of jeopardizing the doctor/patient relationship, and also by a lack of complete knowledge about the nature of specific conditions which are considered to impair safe driving ability. There is a need for improved communication between physicians and the M.T.C. in order that drivers with unacceptable medical conditions can be readily identified and their driving privileges can be reassessed. This is especially important for older drivers who are more likely to develop medical problems such as vision deficiencies and heart conditions. The Private Motor Truck Council of Canada (P.M.T.C.) reported that 66% of its members conduct their own medical examinations of prospective employees, and periodically re-examine their existing drivers over and above the licensing requirements.

3.3.3. The Ontario M.T.C. has its own Medical Review Program to ensure that driver licence applicants and holders satisfy the fitness standards set out under H.T.A., Regulation 462. Information regarding medical conditions is obtained from a variety of sources:

(a) physicians and optometrists (required to report under H.T.A.),
(b) family and friends,
(c) collision, police, or court reports,
(d) applications for higher class licences.

The licence holder is requested to complete and file a Driver's Medical Examination Report to the Ministry, which is evaluated by one of eight Case Review Officers in the M.T.C. Medical Review Unit at Downsview. Clear-cut cases are handled at this level; however questionable cases are referred to the Senior Medical Review Officer, who may make a decision based on physicians' reports and driving records. Cases still questionable are sent on to one of two Medical Advisory Committees. The two committees each provide expert medical opinion on the status of drivers under review, including all cases likely to result in licence suspension or downgrading. They are composed of three specialists: a neurologist, a psychiatrist and an internist. The Medical Advisory Committees are appointed indefinitely by the Minister and meet at Queen's Park about 75 times annually. The meetings are closed to the applicant and the members are anonymous. They may ask for specialist consultation before making a recommendation to the Registrar who then makes a decision on behalf of the Minister. The licence applicant/holder being reviewed is informed in writing of referral to the M.A.C. and also of the decision reached.

Suspended licence holders have the right to ask for a medical hearing. An M.T.C. Hearing and Review Officer (posted throughout the Province) meets with the person. If new evidence or information is introduced at this hearing, then the case is sent back to the Medical Advisory Committee for re-evaluation.

Otherwise, the Hearing and Review Officer implements the decision.

Ontario also has a Medical Waiver Program, the purpose of which is to:

(a) provide flexibility in applying the medical standards,
(b) accommodate medical advancements,
(c) recognize drivers who can prove that their medical condition has stabilized and that there is no threat to the safety of other road users.

Except for vision and hearing, all other conditions which could disqualify a licence holder from a particular class of licence may be waived. If downgraded, a driver is informed that he/she may apply for medical waiver. A medical waiver hearing is held (interview between driver and M.T.C. driver counsellor). The driver is often asked to bring a certificate of medical fitness from his family doctor, a letter from his employer, and any other information which may be requested. The driver's file is sent to the Medical Advisory Committee which makes a recommendation to the Registrar/Minister who in turn makes a decision, and the driver is informed of the decision by mail. A successful waiver must be renewed annually.

Drivers who apply for a medical waiver and have the decision go agains them may appeal through the Ontario Driver Licence Suspension Appeal Board. Each hearing consists of a chairman, two members and the secretary, who are drawn from a body of about thirty laymen, mostly lawyers. The Board is independent of M.T.C. Its purpose is to make sure that persons who have had their licence suspended or downgraded, due to medical reasons or otherwise, are treated fairly and based on its own hearings, the Board confirms or rejects the Registrar's decision. Waiver applicants who have the Board rule against their case may appeal before a County or District Court. The Registrar is bound by rulings made by both the Licence Suspension Appeal Board and, of course, by the Courts. During 1981 more than 89,000 cases were reviewed, of which 2,600 were deemed unsatisfactory. Of a total of 162 waiver applications received, 126 were granted and 36 rejected.

3.3.4. The C.M.A. brief to the Commission pointed out that three phases of safe operation of a motor vehicle involve the driver, namely: perception, interpretation and reaction. All three phases involve training, physical fitness, emotional status, and are affected by exposure to alcohol, drugs and carbon monoxide. The C.M.A. has contended for many years that the education for all classes of licence are less than adequate and considers that training and re-training are necessary for the development of good reflexes in crash avoidance. Driver inattention may be affected by fatigue, boredom, lack of physical fitness, emotional status or by alcohol, drugs or the inhalation of

carbon monoxide. The latter fact is of importance in congested, slow-moving traffic and may be enhanced by cigarette smoking. The C.M.A. identified several controversial issues such as myocardial infarction (blood clots), diabetes, drugs, alcohol and fatigue, but came to the conclusion that "there is as yet little scientific evidence that can be used to assess the degree of impairment to driving that results from any specific medical disability" so the C.M.A. recommended a program of basic research.

This Commission endeavoured to survey the recent literature on the effects of alcohol and drugs on the drivers of commercial vehicles. The most useful references were: Baker 1975; Nix-James 1977; Kendrick et al 1979; Perchonock 1980; and Eicher et al 1982. The role of alcohol in vehicle accidents has been studied extensively and is well established for motorists but the scope and nature of the problem among truck drivers is not so well defined. Generally in the U.S.A., alcohol-related accidents among truck drivers ranged from less than 3% of the total reported accidents, whereas the figure for passenger car drivers was about 7%. However, for accidents in which the truck driver was killed, alcohol involvement was as high as 36%. The major reasons for the wide variations in findings is thought to be due to differences in alcohol detection methods and the selection of the drivers studied. During 1979 the Ontario Ministerial Committee on Drinking-Driving commissioned a roadside blood alcohol content (B.A.C.) survey to determine the number of drinking drivers on the road at night (Eicher et al 1980). The survey did not identify truck drivers specifically but it revealed that 6.6% of all Ontario drivers tested had a B.A.C. exceeding the legal limit and about 13% had a B.A.C. over 0.5 milligrams which is the level at which impairment begins to be significant.

3.3.5. Little is known about drug involvement in accidents and none of the studies focussed on the drivers of large trucks. Until recently there have been many problems with the drug analysis procedures which were used to detect or measure the drugs in a driver's blood or urine, so the evidence is controversial. However, as high as 10% for marijuana and 7% for tranquillizers has been estimated in the bodies of drivers involved in crashes in the U.S.A. One controversial report indicated that as high as 20% of drivers under 25 years of age use "pep pills" occasionally, and as high as 9% use marijuana occasionally while driving. The U.S. N.H.T.S.A. plans a major study of alcohol and drug involvement for 1983. The study will identify drivers of large trucks as a sub-population of fatally injured drivers. Intake of alcohol can be rapid but the rate of removal from the body is slow. Approximately 15 mg. of alcohol are removed by oxidation per hour so no alcohol should be consumed within four to eight hours of commencing to drive. In combination with alcohol, drugs may play a significant role in causing accidents and the dangers of combinations

of medication may not be recognized by drivers and even by some physicians.

Recently a joint committee of the Canadian Bar Association and the Canadian Medical Association recommended amendments to the Criminal Code of Canada to allow for compulsory blood samples to be taken by qualified persons to permit testing for alcohol and other drug levels, in circumstances in which a police officer has reasonable grounds to believe that a driver's ability is impaired.

3.3.6. Fatigue has been identified as a major contributing factor in road accidents. During the 1970's the relationship of hours-of-work to truck safety was studied extensively in the U.S.A. and Europe with widely varying results (see Large Truck Accident Causation, N.H.T.S.A. 1982) but it appears that:

(a) significant increases in driver error begin to show as early as the fourth hour of driving, and the frequency of accidents increases disproportionately after about seven hours,

(b) the adverse effects of prolonged driving are more pronounced for drivers aged 45 or more,

(c) rest breaks become less effective as time goes by,

(d) about twice as many accidents occur between midnight and 8 a.m. when the level of alertness is low,

(e) cumulative effects of fatigue appear after four consecutive days. However fatigue varies greatly among individuals and depends on a host of variables in addition to hours of work, like age, emotional state, noise, traffic conditions and the weather.

The N.H.T.S.A. reported that several studies have found medical conditions to be a significant contributing factor in accidents, perhaps in as high as 15% but the data for truck drivers are scarce. The U.S. B.M.C.S. has planned to investigate accident involvement by medical condition through research to be conducted in Canada. The analysis would consist of comparing the records of drivers involved in accidents with information from their corresponding medical records. The data required are accessible from Ontario's driver records and maybe from the medical files, and the results would be relevant to both Ontario and the U.S.A. In the study it is intended to identify the rate at which medical conditions are going unreported and the levels of risk associated with specific impairments suffered by heavy truck and bus drivers. This will be particularly important for diabetic and cardiovascular and psychiatric disorders.

The Hamilton-Wentworth Council on Road Trauma endorsed the C.M.A. brief to the Commission and made a number of additional significant observations and recommendations. Among these were:

(a) the need to develop a brochure outlining the dangers of medication/drug/alcohol combinations,

(b) drivers should not consume alcohol within eight hours of commencing work,

(c) truck stops should not be licensed to sell alcoholic beverages,

(d) blood alcohol level testing should be mandatory for all drivers involved in accidents,

(e) the need for stiffer regulations of cardiac status,

(f) the need for tachographs to monitor hours of work and rest periods,

(g) the need for hours of work control to avoid fatigue and to control speed,

(h) the need for the development of seat belts suitable for truck drivers.

3.4. Truck Driver Management

3.4.1. The selection procedures employed by the trucking industry vary considerably. Many companies have effective initial screening of candidates but the majority of drivers may not be subjected to any stringent check, and many small companies require only a valid truck driver's licence for employment. The extent and type of screening depends on the scope of the trucking operation and the types of trucks used. It also is partly dependent on the availability of drivers. In unionized operations the older, more experienced drivers with the greatest seniority get preference. When there is an over-supply of drivers, companies tend to be more selective and one would expect the truck accident record to decline during economic recessions.

The U.S.A. Federal Motor Carrier Safety Regulations require candidates to provide their prospective employer with a list of any traffic violations they may have incurred during the previous three years, and the employer is required to investigate the background of each new driver within thirty days of employment. Insurance companies can provide model application forms and recommended procedures. The Canadian Trucking Association recommends that a hiring program should include:

(a) recruiting sources
(b) a preliminary application
(c) a formal application
(d) evaluation criteria
(e) an employment interview
(f) a check of references
(g) a medical examination
(h) a driving record check
(i) a road test
(j) an acceptance interview

3.4.2. Most trucking companies supervise and monitor their drivers' adherence to the companies' policies and there usually are incentives for safe and efficient drivers. However, there is a very wide variety of standards. Some companies employ their own fleet safety supervisors while others use outside advisers like the Ontario Safety League. Supervisors accompany drivers periodically and identify poor practices. A company may employ its own inspectors to report on the performance of its drivers but many rely on reports from other drivers, motorists and the police. The O.T.A. maintains a cooperative safety road patrol and has observers evaluating the performance of drivers of member companies. So also does the Markel Insurance Company for its clients. Some companies require periodic reports of motor vehicle convictions, medical examinations and credit ratings. It was noted at several Commission public hearings

FIGURE 5

HOURS OF WORK LEGISLATIVE SUMMARY

		CANADA LABOUR CODE	EMPLOYMENT STANDARDS ACT. SPECIAL PERMIT 1974	FEDERAL MOTOR CARRIER SAFETY REGULATIONS (USICC)
laximum lours er lay	Driving	10 HOURS	10 HOURS	10 HOURS
	On Duty	15 HOURS	No hours specified	15 HOURS
xceptions to aily Maximums		12 Hrs,2 times per week as long as max. hrs.not exce--eded	Extension to 12 hrs. per day. By Permit Only	Exceptions only for adverse weather conditions or some geographic locations
laximum Hours per eek driving		60 Hrs./ 7 consecutive days	60 Hrs./7 consecutive days.	60 hrs./7 consecutive days.
laximum Hours per ime frame		70 Hrs./ 8 consecutive days	see above	70 hrs./8 consecutive days.
rescribed Rest Periods		10 Min.following 4 consecutive hrs. or 30 min.following 6 consecutive hours.	None, but a prescribed eating period, after 5 consecutive hours on duty.	None
rescribed Off uty periods		24 Hrs.off duty before 7 consecutive days on duty and 8 Hours off duty before any shift	NO	8 Consecutive Hours off duty before a 10 hour shift 24 consecutive hrs off before 7 consecutive days on duty.
xceptions to egislated require-ents.		By special permit and dependent on type of operation.	None	dependent on operation

Source: Ontario Trucking Association Submission, Safe Trucking Is Good Business, 1982

that the key to successful driver supervision is dedication to good safety by senior management. The Canadian Trucking Association has an Accident Prevention Program Manual which recommends that:

(a) a safety policy statement be issued to all employees,
(b) periodic safety meetings be held,
(c) senior management attend safety functions,
(d) safety awards be presented to deserving drivers,
(e) safety bulletins be posted regularly.

3.4.3. Hours of work for trucking employees are regulated by: The Ontario Employment Standards Act 1974, Part IV; The Canada Labour Code, Part IV; and The U.S. Federal Motor Carrier Safety Regulations for all Canadian operations entering the U.S.A. A summary is given in Figure 5. Thirty-eight of the states of the U.S.A. and most of the Canadian provinces have similar legislation. We see that professional drivers are expected to work up to 15 hours per day with a maximum of 10 hours driving. These are very long hours! Rest periods are specified but it is difficult to determine if they are actually observed by individual drivers. Overlapping jurisdictions can present problems; for example, an interprovincial carrier operating between Toronto and Montreal is under the jurisdiction of the Canada Labour Code but a private carrier based in Ontario and moving along the same highway is covered by the Ontario Employment Standards Act. The Ontario Ministry of Labour enforces the former and Labour Canada enforces the latter, but they both rely on company records of hours of work, rather than roadside checks.

The O.T.A. recommends that the federal requirements be adopted by all levels of government and that M.T.C. officials should be empowered to conduct roadside checks. The Teamsters Joint Council drew attention to the long working hours compared with those of the average industrial employee, and the Teamsters suspect that employees whose jobs are insecure or who are willing to work longer hours, do not complain to the Minister of Labour so no investigation takes place. The Commission heard many complaints about owner-operators, who are not covered by the regulations, driving their vehicles well in excess of the maximum periods allowed. The Teamsters and the O.T.A. agreed that the problem is greatest with small, unorganized carriers. The Teamsters, and others, noted that the provincial and federal officials are understaffed and cannot enforce the recommendations so the union must negotiate reasonable maximum hours of work and layover provisions with employers. The Hamilton Automobile Club believes that the responsibility lies with the trucking industry. The Private Motor Truck Council of Canada recommended that drivers' hours of work be standardized throughout Canada, but that there should be enough flexibility to accommodate the wide range of weather, traffic patterns and geography.

In Europe, hours of service regulations are more restrictive than in North America, with shorter hours of driving and longer rest periods, but the European Council of Ministers of Transport reported in 1980 that the regulations do not seem to have had any great influence on the driver's actual behaviour which is dictated by the needs of the moment. The Ontario Minister of Labour is at present assessing the adequacy of the overtime provisions of the Employment Standards Act as they apply to trucking and a report is expected in the spring of 1983.

Owner-operators often have irregular schedules and are under extreme pressure to make quick turn-arounds and extra trips in order to meet the high costs of operation and to meet loan payments, whereas company-employed drivers have more regular schedules and regular income and are usually under less stress. The U.S.A. F.H.A. found little evidence of a direct relationship between hours of service and accident frequency and severity, and abandoned its proposed revisions to its regulations in 1981. Research in Britain, France and Australis has also found widely varying evidence for a correlation between accidents and duration of driving. This is probably because few drivers will admit to falling asleep at the wheel and it may be impossible to collect conclusive evidence.

3.4.4. The Ontario Safety League offers a variety of supervisory and management training courses and their 1983 program includes the following short courses:

(a) Human Relations Course for Supervisors (2 days)
(b) Fleet Maintenance Course (3 days)
(c) Motor Fleet Driver Training Course (2 weeks)
(d) Vehicle Accident Investigation Course (3 days)
(e) Advanced Fleet Driver Training Course (5 days)
(f) Fleet Supervisor Course (5 days)
(g) Technique of Instruction (5 days)
(h) Advanced Techniques in Fleet Safety Management (2 days)

3.5. THE COMMISSION RECOMMENDS THAT:

1. The Ministry of Transportation and Communications should review and evaluate the truck drivers' tests under development by Transport Canada and by the U.S.A. National Highway Traffic Safety Administration. Ontario should support initiatives to achieve reciprocity in testing procedures between provinces and states.

2. In order to have a credible testing program, and a consistent standard of licensing, M.T.C. driver-examiners should hold at least the class of licence being applied for by the applicant, as is currently required in Saskatchewan and Manitoba.

3. The performance test for any class of licence should be conducted in a vehicle which is typical of that class. Class A applicants should be required to take the test in a tractor-trailer. The performance test should include an approved pre-trip vehicle inspection.

4. The written test should be made more comprehensive and should include knowledge of the vehicle dynamics, emergency driving, mechanical failures, cargo security, first aid practices, effects of fatigue, alcohol and drugs, as well as the requirements of the Highway Traffic Act.

5. The M.T.C. should implement an air-brake licence endorsement program and a combination vehicle endorsement program as soon as possible.

6. The present Probationary Driver System should be extended to Classes D and A and should require the successful completion of a professional driver improvement course approved by the M.T.C. Individuals should first hold a valid Class D licence to be eligible for Class A.

7. Class B and C bus drivers should NOT be permitted to drive heavy trucks without first qualifying for a Class D licence, and Class D licence holders should be re-examined periodically as are Class A holders at present.

8. The Canadian Conference of Motor Transport Administrators, in consultation with the Canadian Police Information Centre, should examine the feasibility of establishing a Canadian National Commercial Driver Register in order to identify licences which have been remoked or which are under suspension and to control multiple licensing.

9. The terms of reference and membership of the Provincial Consultative Committee on Truck and Tractor-Trailer Driver Training should be strengthened and the Committee should be asked to review the curricula proposed by Transport Canada and the U.S. Bureau of Motor Carrier Safety, and to make recommendations for the up-grading and accreditation of formal programs for the following levels of instruction:

(a) Straight truck driver

(b) Tractor-trailer driver

(c) Advanced driver

(d) Multiple trailer driver

(e) Driver Instructor

(f) Chief Driving Instructor

10. The Driver Certification Program for the granting of Recognized Authority status should NOT be extended to private truck driving schools until the above review is completed.

11. Straight truck driver training should be considered a vocation under the Private Vocational Schools Act, as tractor-trailer driver training is at present, and M.T.C. should develop minimum qualifications and establish examinations for the licensing of the various levels of driving instructor.

12. All the recommendations of the Canadian Medical Association in the Fitness to Drive Guide should be adopted by the province of Ontario. The Commission endorses thd C.M.A. recommendations for the ages and periods at which truck drivers should be re-examined medically.

13. The M.T.C. should tighten the conditions for granting medical waivers for truck drivers suffering from hearing problems, cardiovascular diseases, and metabolic diseases.

14. The M.T.C. should cooperate with the U.S.A. National Highway Traffic Safety Administration in its proposed research into medical impairment, including that on alcohol and drug involvement.

15. The M.T.C. should prepare and distribute a brochure outlining the dangers of consumption of combinations of alcohol, medication or drugs.

16. The Commission endorses the joint recommendations of the Canadian Bar and the Canadian Medical Associations and recommends further that blood alcohol tests should be mandatory for all truck drivers who are involved in fatal accidents.

17. The Government of Canada, in consultation with the Canadian Medical Association and enforcement agencies, should investigate the desirability of lowering the presently permissible blood alcohol levels.

CHAPTER IV THE VEHICLE

4.1. Sizes and Types of Trucks

4.1.1. In most countries of the world, specific regulations have been established to limit the size, weight and configurations of commercial vehicles and to control their operation. Traditionally, size restrictions were established to protect the public investment in road and bridge construction. Vehicle sizes were limited by the capacities of bridges, tunnels and overhead signs, and safety considerations were secondary. If the restrictions on vehicle size are too stringent, the costs of the highway transportation of goods will be high and these costs will be passed on to the consumer. On the other hand, if the restrictions are too lenient, the highways may be damaged and the costs of maintenance will be high, so the public may have to pay for excessive repair and reconstruction costs.

In Canada, maximum vehicle size and weight regulations are the responsibility of individual provinces and territories. In the U.S.A. the laws are generally the responsibility of the individual states, except on the U.S. Interstate Highway System which is under federal control. Until recently the maximum size and weight standards in Canada were nearly the same as those recommended by the American Association of Highway State Officials and this was probably due to the common highway and bridge design standards employed by Canadian and U.S. highway engineers. However, Ontario independent research and accumulated experience led to an increase in 1971 of our maximum allowable sizes and weights. Similarly Quebec increased its maximum limits in 1980.

4.1.2. A large variety of different truck configurations operate across Canada and the U.S.A. The variations have been determined by the type of cargo to be carried, the local geography and the permissible sizes. For example, petroleum carriers are different from gravel trucks. The "cab-over-engine" type of tractor was developed to keep tractors plus trailers within permissible length limits. There is a jargon used in the trucking industry which is picturesque but may be confusing, and there are some terms which must be defined in order to understand the safety implications.

(a) A straight truck is a motor vehicle having a permanently attached cargo body designed to carry goods.
(b) A tractor is a motor vehicle designed to draw other vehicles including trailers.
(c) A trailer is a vehicle designed to carry goods, to be drawn by another motor vehicle but supporting all of its own weight and load on its own wheels.
(d) A semi-trailer is a trailer which has no front axle and which is coupled to the tractor by a "fifth wheel" and "king-pin" so that part of the trailer and its load rests on the tractor.
(e) A trailer-converter dolly is a device consisting of one or more axles and tow bar designed to connect a semi-trailer to another trailer.

There are many possible combinations of a straight truck towing a trailer, a semi-trailer or more than one trailer (see Fig. 6). Tractors may tow one or more semi-trailers and they may use different types of trailer-converter dollies. Some configurations are more stable than others so there are severe restrictions on the number and size of trailers permitted. The most popular are the straight truck and the tractor plus semi-trailer. If there is more than one trailer, it would be a tractor plus semi-trailer plus semi-trailer (i.e. a "double") or a tractor plus two semi-trailers (i.e. a "triple"). There are two ways of connecting the trailers called "A" trains of "B" trains. In the A train configuration, the second trailer is connected to the first semi-trailer by a dolly. It has the advantage that semi-trailers can be easily interchanged but the dolly adds to the overall length. In the B train configuration, the second semi-trailer overlaps and rests on the rear axles of the first semi-trailer. It has the advantage of shorter length and greater stability but the volume available for cargo is reduced and rear end loading is difficult. The B trains are used extensively by petroleum product carriers.

There are certain configurations which are permitted in some provinces and states:

(a) The Twin 45 or Turnpike Double has a tractor pulling two semi-trailers, which are usually 45 feet long. They may be either A trains or B trains.

(b) The Rocky Mountain Double has a tractor pulling a twin axle 45 foot semi-trailer plus a shorter second semi-trailer up to 30 feet long, in a B train configuration.

(c) The Triple Trailer Combinations have a tractor pulling three semi-trailers in the A configuration. It can also be made into a B train by using what is known as a "stinger". The trailer may be up to 30 feet long.

The A Train Double has three articulation points: at the fifth wheel of the tractor; at the pintle hook at the rear of the first trailer; and at the fifth wheel on the dolly converter. The B Train Double has only two articulation points: at the fifth wheel of the tractor and at the fifth wheel of the first trailer. Generally speaking, the fewer the number of articulation points, the more stable is the combination, but a lot depends on how the weight of the load is distributed. The A Train Triple has five articulation points.

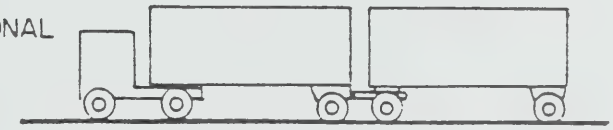
There has been a substantial growth over the past twenty years in the legal use of multiple-trailer truck combinations. Turnpike Doubles have been permitted on the Kansas Turnpike and also on the toll roads of Indiana, Ohio, New York and Massachusetts for a decade. The province of Quebec has permitted the use of Twin 45's under special permit but only on specific routes and under strict control. Alberta and Manitoba and several western U.S. states allow Triple Trailer combinations on designated highways and routes. In section 8.5. we will discuss some tests and a road demonstration of couples and triples

FIGURE 6

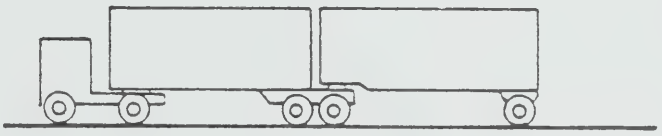
COMBINATION TRUCKS

5 AXLE TRACTOR
SEMITRAILER
45 FT TRAILER

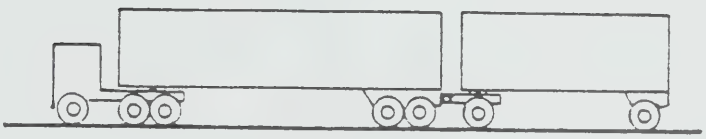
65 FT CONVENTIONAL
DOUBLE -
27 FT TRAILERS



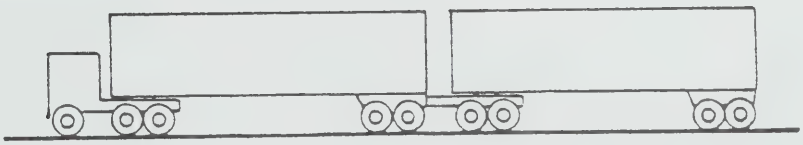
B-TRAIN DOUBLE
27 FT TRAILERS



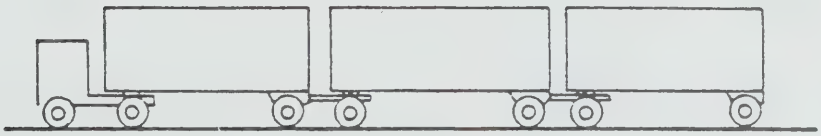
ROCKY MOUNTAIN
DOUBLE-45 FT &
27 FT TRAILERS



TURNPIKE DOUBLE
45 FT TRAILERS



TRIPLE-
27 FT TRAILERS



Source: Highway Safety Research Institute,
University of Michigan

which were conducted in Ontario in 1982 under the sponsorship of this Commission.

4.1.3. There are enormous variations in the permissible sizes and weights of trucks across Canada and the U.S.A. Provinces, states and municipalities tend to set their own requirements according to the nature and limitations of their roads, and only recently did the safety implications of vehicle stability and manoeuverability have to be considered. The complexity of regulations is compounded by the fact that Canada uses metric measurements (System International) while the U.S.A. still uses the British system. An excellent summary of the present Canadian size and weight requirements was compiled and published by Bus and Truck Transport Magazine in September 1982 which makes it possible to compare provincial regulations. (See Fig. 7).

Ontario limits the length of straight trucks to 12.5 metres, as do eight other provinces. This was increased from 11 metres during the summer of 1982 over the objections of the Ontario Automobile Association. The change was justified by the need for conformity as adopted by the Conference of Ministers Responsible for Transportation and Highway Safety in 1981, and is consistent with practices in most of the U.S.A. and many European countries. Ontario restricts the overall length of a combination of vehicles coupled togethe to a maximum of 21 metres (68.9 feet). Except for car carriers, no semi-trailer may exceed 14 metres. British Columbia permits 23 metres on certain triple combinations while Alberta, Saskatchewan and Manitoba permit 23 metres under special circumstances. European countries have a wide range but most allow only 15.5 metres, although Sweden permits 24 metres for tractors plus semi-trailers. More important to Ontario is the American practice where most states allow only 65 feet (19.8 metres) or less. The laws of some states specifically prohibit certain truck combinations but in January 1983 the U.S.A. passed legislation requiring the states to allow an overall vehicle combination length of not less than 65 feet on the National System of Interstate and Defence Highways. It is clear that length regulations are quite variable and they are still quite controversial because of doubts about stability and braking.

The maximum width permitted in Ontario is 2.6 metres (102 inches) which conforms with the other provinces. The vast majority of American trucks are only 2.4 metres (96 inches) wide but the U.S. National System of Interstate Defence Highways' permissible width was increased to 102 inches in January 1983. Most European countries permit only 2.5 metres. Width considerations are affected by the available road-widths and by vehicle stability. The maximum height permissible in Ontario is 4.15 metres (13.6 feet) and this conforms with recommendations which were adopted by the provincial Transport Ministers in 1981. In the U.S.A. about 90% of the states limit the height to 13.5 feet but there is a trend toward accepting 14 feet, as structural clearances

FIGURE 7

Canadian size and weight requirements for commercial vehicles

Revised September 1982

Figures printed in **bold face** are in standard units (ft, in., lb). Figures printed in light face are in metric units (m, kg).

	NFLD.	N.S.	N.B.	P.E.I.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	Y.T.	N.W.T.
LENGTH Single Powered Vehicle (ft, m)	**41.0** 12.5	**41.0** 12.5	**45,9** 14.0 **EE**	**40.0** 12.2	**36.1** 11.0	**41.0** 12.5	**41.0** 12.5	**41.0** 12.5	**41.0** 12.5	**41.0** 12.5	**41.0** 12.5	**41.0** 12.5
OVERALL LENGTH Combination (ft, m)	**65.6** 20.0	**65.6** 20.0	**65.6** 20.0	**65.6** 20.0	**65.6** 20.0 **DD**	**68.9** 21.0	**65.6** 20.0 **D**	**65.6** 20.0 **D**	**65.6** 20.0 **D**	**65.6** 20.00 **CC**	**72.2** 22.0	**65.6** 20.0
MAXIMUM WIDTH (in., m)	**102.4** 2.6	**102.4** 2.6	**102.4** 2.6	**102.4** 2.6	**102.4** 2.6	**102.4** 2.6	**102.4** 2.6	**102.4** 2.6	**102.4** 2.6	**102.4** 2.6	**102.4** 2.6	**120.0** 3.05
MAXIMUM HEIGHT (ft, m)	**13.5** 4.1	**13.6** 4.15	**13.5** 4.12	**14.8** 4.5	**13.6** 4.15	**13.6** 4.15	**13.6** 4.15	**13.6** 4.15	**13.5** 4.15	**13.5** 4.12	**13.8** 4.2	**13.8** 4.2
NUMBER OF TRAILERS ALLOWED	**2**	**2,S**	**2**	**A**	**2**	**A,S**	**2,Q**	**2,A**	**2,A**	**2,B**	**2,W**	**2,GG**
MAXIMUM LOADS (lb, kg) Single Axle (except front)	**19,900** 9,000	**19,900** 9,000 **F**	**19,900** 9,000	**20,000** 9,100	**22,000** 10 000 **J**	**22,000** 10 000 **Z**	**20,000** 9,100 **X**	**20,000** 9,100 **W**	**20,000** 9,100	**20,000** 9,100	**22,000** 10,000	**20,000** 9,100
LOADS (lb, kg) Tandem Axles	**39,700** 18,000	**37,500** 17,000 **F**	**39,700** 18,000 **M**	**40,000** 18,100 **K,M**	**44,000** 20,000 **J**	**42,100** 19,100 **AA**	**35,000** 16,000 **X**	**35,000** 16,000 **W**	**35,000** 16,000	**37,500** 17,000 **C**	**42,100** 19,100 **E**	**35,000** 16,000
Straight truck: 2 axles	**29,800** 13,500 **T**	**29,800** 13,500 **L**	**29,800** 13,500 **FF**	**30,000** 13,650 **L**	**40,800** 18,500 **JP**	**41,800** 19,000 **G**	**32,000** 14,600 **X**	**32,000** 14,600 **W**	**36,100** 16,400	**32,000** 14,500 **T**	**33,000** 15,000 **E**	**30,000** 13,600 **E**
Tandem straight truck: 3 axles	**47,400** 21,500 **T**	**47,400** 21,500 **L**	**47,400** 21,500 **FF**	**47,500** 21,550 **L**	**62,800** 28,500 **JP**	**62,000** 28,300 **G**	**47,000** 21,500 **X**	**47,000** 21,500 **W**	**51,400** 23,300	**49,500** 22,450 **C,T**	**55,100** 25,000 **E**	**45,000** 20,400 **E**
Tractor and semitrailer: 3 axles	**49,600** 22,500 **T**	**49,600** 22,500 **L**	**49,600** 22,500 **FF**	**50,000** 22,550 **L**	**62,800** 28,500 **JP**	**62,000** 28,300 **G**	**52,250** 23,700 **X**	**52,000** 23,600 **W**	**56,000** 25,400 **W**	**52,100** 23,650 **T**	**55,100** 25,000 **E**	**50,000** 22,700 **E**
Tractor and tandem semitrailer: 4 axles	**69,500** 31,500 **T**	**69,500** 31,500 **L,W**	**69,500** 31,500 **FF**	**70,000** 31,800 **K,L,M,**	**84,900** 38,500 **JP**	**83,350** 37,800 **G**	**67,500** 30,600 **X**	**67,500** 30,600 **JJ**	**71,000** 32,200 **W**	**69,600** 31,550 **C,T**	**75,200** 34,100 **E**	**65,000** 29,500 **E**
Tandem tractor and semitrailer: 4 axles	**69,500** 31,500 **T**	**69,500** 31,500 **L,W**	**67,200** 30,500 **FF**	**67,500** 30,700 **L,M**	**84,900** 38,500 **JP**	**83,350** 37,800 **G**	**67,500** 30,600 **X**	**67,500** 30,600 **JJ**	**71,000** 32,200 **W**	**69,600** 31,550 **C,T**	**77,200** 35,000 **E**	**65,000** 29,500 **E**
Tandem tractor and tandem semitrailer: 5 axles	**87,100** 39,500 **T**	**87,100** 39,500 **L,W**	**87,100** 39,500 **FF**	**87,500** 39,700 **K,L,M**	**106,900** 48,500 **JP**	**104,700** 47,500 **G**	**82,700** 37,500 **X**	**82,000** 37,500 **W**	**86,000** 39,000 **W**	**87,000** 39,450 **C,T**	**95,250** 43,200 **E**	**80,000** 36,400 **E**
Tandem tractor and 3-axle semitrailer: 6 axles	**106,900** 48,500 **T**	**106,900** 48,500 **L,W**	**106,900** 48,500 **FF**	**107,500** 48,700 **K,L,M**	**126,800** 57,500 **JP**	**123,500** 56,000 **G**	**82,700** 37,500 **X**	**82,000** 37,500 **W**	**86,000** 39,000 **W**	**92,500** 41,950 **C,T,U**	**116,200** 52,700 **E**	**100,000** 45,400 **E**
Straight truck and full trailer: 5 axles	**69,500** 31,500 **T**	**69,500** 31,500 **L**	**69,500** 31,500 **FF**		**84,900** 38,500 **JP**	**83,350** 37,800 **G**	**72,300** 32,800 **X**	**72,300** 32,800 **JJ**	**76,000** 34,500 **D,W**	**72,200** 32,750 **T**	**77,200** 35,000 **E**	**70,000** 31,800 **GG**
Straight truck and tandem full trailer: 6 axles	**89,300** 40,500 **T**	**89,300** 40,500 **L,W**	**89,300** 40,500 **FF**		**106,900** 48,500 **JP**	**104,700** 47,500 **G**	**87,500** 39,700 **X**	**87,000** 39,500 **W**	**91,000** 41,300 **D,W**	**79,400** 36,000 **T,V**	**90,600** 41,100 **E**	**80,000** 36,400 **GG**
Tandem straight truck and tandem full trailer: 6 axles	**107,000** 48,500 **T**	**107,000** 48,500 **L,W**	**107,000** 48,500 **FF**		**126,800** 57,500 **JP**	**123,500** 56,000 **G**	**102,750** 46,600 **X**	**102,000** 46,300 **W**	**106,000** 48,100 **D,W**	**102,650** 46,550 **T,V**	**117,300** 53,200 **E**	**100,000** 45,400 **GG**
Tractor semitrailer, full trailer: 5 axles - A-train	Special permit required.	**89,300** 40,500 **L,W**	Special permit required.	Special permit required.	**106,900** 48,500 **JP**	**104,700** 47,500 **G**	**92,400** 41,900 **X**	**92,000** 41,700 **W**	**96,000** 43,500 **D,W**	**79,400** 36,000 **T,V**	Special permit required.	**100,000** 45,400 **GG**
Tandem tractor, tandem trailer, full trailer: 6 axles - A-train		**110,250** 50,000 **W**			**126,800** 57,500 **JP**	**139,600** 63,300	**122,800** 55,700 **X**	**118,000** 53,500 **W**	**118,000** 53,500 **D,W**	**127,100** 57,650 **C,T,V**		**110,000** 50,000 **GG**
Tandem tractor, tandem semitrailer, tandem full trailer: 6 axles - A-train		**110,250** 50,000 **W**			**126,800** 57,500 **JP**	**140,000** 63,500	**124,600** 56,500 **X**	**118,000** 53,500 **D,W**	**118,000** 53,500 **D,W**	**130,000** 59,000 **C,T,V,**		**110,000** 50,000 **GG**
Tandem tractor, tandem semitrailer, tandem semitrailer: 6 axles - B-train	**115,750** 52,500 **HH**	**110,250** 50,000	**125,000** 56,500	**118,000** 53,500	**126,800** 57,500 **JP**	**139,600** 63,300	**118,000** 53,500 **X**	**118,000** 53,500 **D,W**	**118,000** 53,500 **D,W**	**124,500** 56,450 **C,T,V**	**139,600** 63,300 **G**	**110,000** 50,000 **GG**
Tandem tractor, tandem axle semitrailer, tandem semitrailer: 7 axles - B-train	**115,750** 52,500 **HH**	**110,250** 50,000	**125,000** 56,500	**118,000** 53,500	**126,800** 57,500 **JP**	**140,000** 63,500	**118,000** 53,500 **X**	**118,000** 53,500 **D,W**	**118,000** 53,500 **D,W**	**130,000** 59,000	**139,600** 63,300 **G**	**110,000** 50,000 **GG**
For further information contact:	**709/737-3808**	**902/424-4355**	**506/453-2802**	**902/892-5306**	**418/643-6864**	**416/248-3501**	**204/944-3898**	**306/565-4848**	**403/343-5293**	**604/387-1877**	**403/667-5670**	**403/873-7402**

Key to abbreviations

- **A**— Limited by length of train only, except in Alberta, Manitoba and Saskatchewan where two trailers are generally permitted, and triple trailers are allowed on divided highways by special permit
- **B**— If gross weight of combination is greater than 24,000 lb (5,300 kg)
- **C**— Based on axle spacings between 65 in. and 73 in. (1.65 and 1.85 m)
- **D**— A combination must not exceed 70.5 ft (21.5 m) — 75.5 ft (23.0 m) in Alberta, Manitoba and Saskatchewan and where distance from pin to rearmost trailer is 55 ft (16.75 m) or less
- **E**— Must meet axle spacing and tire size regulations. Based on 11,000 lb (5,000 kg) on steering axle, but subject to increase when front axle and tires designed for more. Gross weight over 85,000 lb (38,500 kg) allowed only on certain highways
- **F**— Tolerance is 1,100 lb (500 kg) per axle.
- **G**— This is the theoretical maximum gross weight allowed on a vehicle or combination with this number of axles, obtained from Ontario MTC tables, assuming maximum spreads and 19,800 lb (9,000 kg) front axle
- **H**— Maximum regardless of axles
- **J**— Must meet regulations on axle spacing and tire load. Maximum front axle 18,700 lb (8,500 kg), but capacity must be documented over 12,000 lb (5,500 kg)
- **K**— On designated highways only.
- **L**— Based on 10,000 lb (4,550 kg) on steering axle (9,000 lb (4,500 kg) in N.S.), but subject to increase when design capacity more. In N.S. maximum depends on spreads
- **M**— According to spreads and tire size. In N.B. maximum on drive tandem is 37,500 lb (17,000 kg)
- **N**— Buses, 41.1 ft (12.5 m) In Sask. buses 40.0 ft (12.2 m)
- **P**— This is a theoretical maximum gross weight allowed on a vehicle or combination with this number of axles obtained from Quebec tables, assuming maximum spreads and 18,750 lb (8,500 kg) front axle
- **Q**— One full trailer only, though may be towed behind a semitrailer providing combination is no more than 70.5 ft (21.5 m) long. See note D
- **R**— Maximum length of semitrailer 45 ft (13.7 m)
- **S**— Maximum length of semitrailer 45 ft, 11.2 in. (14.0 m)
- **T**— Based on 12,000 lb (5,450 kg) steering axle and providing vehicle meets axle spread and tire requirements
- **U**— Three axles group prohibited unless one steers or articulates.
- **V**— Provided gross-weight-to-horsepower is no more than 300 lb/hp (136 kg/hp) with two drive axles. No combination may exceed 79,365 lb (36,000 kg) unless it has two driven axles
- **W**— On designated highways only, and must meet spread and tire requirements. Front axles load of 10,000 lb (4,540 kg) is assumed. In Alberta maximum loading, plus tolerance, gives 16,000 lb (7,300 kg) front axle load. In N.S. maximum gross weight on schedule C highways is 110,000 lb (50,000 kg), on all others it is 85,000 lb (38,500 kg)
- **X**— On designated Class A highways only. Front axle of 12,000 lb (5,500 kg) is assumed. Maximum gross weight must not exceed 200 lb (90 kg) per 10 mm of tire tread width
- **Y**— Buses, 41 ft (12.5 m)
- **Z**— Front axle over 11,000 lb (5,000 kg) must be rated for the weight
- **AA**— Depending on axle spacing. Super single tires, maximum is 39,600 lb (19,000 kg)
- **BB**— No combination may exceed 65.6 ft (20.0 m) unless it has at least two drive axles
- **CC**— On certain three vehicle combinations 75.5 ft (23.0 m)
- **DD**— Or 69.0 ft (21.0 m) on 3 vehicle combinations and car carriers
- **EE**— Maximum 45.9 ft (14.0 m) for 3-axle vehicle, 36.1 ft (11.0 m) for 2-axle
- **FF**— Assuming 10,000 lb (4,500 kg) on front axle. Gross weights over 85,000 lb (38,500 kg) allowed only on specified highways
- **GG**— Up to 75.5 ft (23.0 m) subject to authority from registrar
- **HH**— Tolerance of 990 lb (450 kg) on each axle
- **JJ**— Steering axle weight 12,000 lb (5,500 kg) subject to manufacturer's rating

Source: Bus and Truck Transport, December 1982

are improved. However, it is still important to keep the centre of gravity of a truck low to avoid rollovers. Small increases in height or width are unlikely to increase load capacity significantly so no representations were made to the Commission to increase the present limitations on height or width.

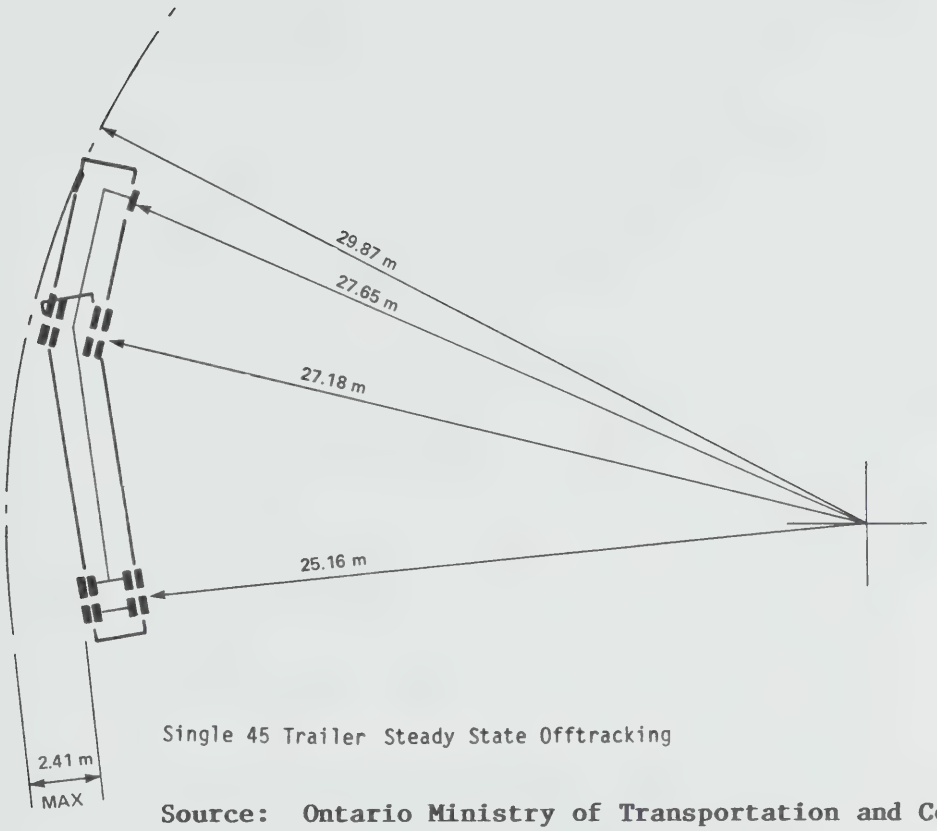
Provincial regulations governing weights are primarily determined by the effects on the road, so that the weight on each axle may be as important as the gross weight. This explains the need for large numbers of axles for heavy loads as is evident in Fig. 7. The axles may be single or in pairs and occasionally in triples. Ontario currently limits the permissible weight on single axles to a maximum of 10,000 kilograms and 19,100 kilograms for tandem axles. The maximum gross weight allowed is 140,000 kilograms which is achievable with tractors plus two semi-trailers with a total of seven or eight axles. These are the highest allowable in Canada, except in Quebec where tandem axles may be loaded to 20,000 kilograms. The Canadian limits are generally greater than those permitted in the U.S.A. For example, the new 1983 legislation requires the states to permit up to 20,000 pounds single, 34,000 pounds tandem and 80,000 pounds gross on the Interstate Highways. In the United Kingdom, the Armitage Commission in 1980 recommended increasing permissible weights, in order to accommodate international containers, to 23,520 pounds single and 41,216 pounds tandem. The permissible axle weight plays a key role in determining the pay-load for different types of trucks and how they may be loaded, so truck size, weight and configuration have a great influence on terminal design.

During recent years, the trucking industry in Canada and the U.S.A. has been pressing for size and weight increases in order to increase carrying capacity and thus their productivity. The industry argues that much greater pay-loads are possible for the same hauling costs by reducing the number of trips required. It is argued that this also will increase safety by reducing the exposure. Opponents contend that increasing the permissible size and weight will cause more rapid deterioration of existing roads and bridges and require greater public expenditures for new roads, bridges and exit ramps.

4.1.4. A review of the accident involvement rate of single-trailer and double-trailer combination trucks produces conflicting findings. Several U.S.A. based research studies in the late 1960's and 1970's found lower accident rates for double trailer trucks when compared to single trailer trucks. The lower accident rate for doubles may have been influenced by other factors such as stricter controls on the operation of these units and drivers. Other U.S.A. research has reported no significant difference between the accident involvement of these two types. However, the U.S. N.H.T.S.A. Large Truck Accident Causation Report states that combination trucks, both single and multiple trailer, were more likely to be involved in motor vehicle accidents than passenger cars or straight trucks for the same number of vehicle miles travelled. Also, accidents involving

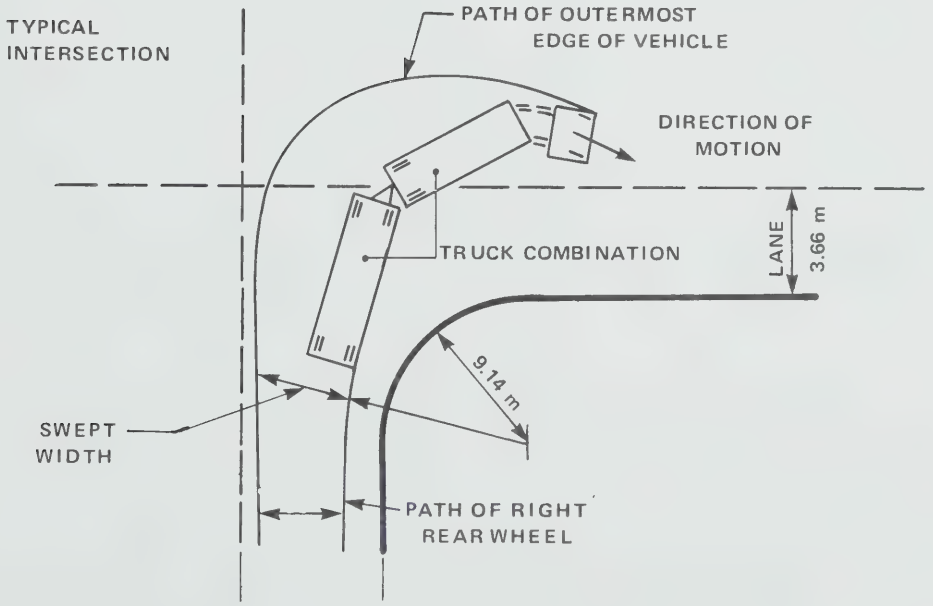
FIGURE 8

OFFTRACKING



Single 45 Trailer Steady State Offtracking

Source: Ontario Ministry of Transportation and Communications, Test and Demonstration of Double and Triple Trailer Combinations, 1982, Report TVS-CV-82-109



Swept Area Offtracking

Source: Ontario Ministry of Transportation and Communications, Commercial Vehicle Accident Survey, 1982, Report RR-235

articulated combinations were more likely to be fatal than accidents involving straight trucks or passenger cars. One out of every three registered combination trucks was involved in an accident in 1978 compared to one out of every 26 straight trucks and one out of every 13 passenger cars!

There are two safety issues associated with longer trucks: offtracking and passing distance requirements. Offtracking is the lateral distance between the tracks made by the front and the rear tires of a vehicle during a turn. Lengthening the wheelbase of a vehicle or a combination of vehicles increases its offtracking and therefore the amount of roadway it requires for a turn. If the offtracking is too great, the vehicle or trailer will encroach into an adjacent traffic lane or cut a traffic corner. Longer wheelbase trucks have more problems on small radius curves such as exit and entrance ramps. The principal limiting factor is not the number of trailers or total combination length, but rather the number and the length of the individual wheelbases. (See Fig. 8). For all types of trucks, a left turn at an intersection generally produces less offtracking than a right turn since the turning radius is usually greater. Similarly, trucks using highway ramps offtrack less than vehicles making right turns at intersections.

The time and distance required to pass and be passed by a long truck is generally perceived as a safety concern by many motorists. This is a smaller problem on highways with four or more lanes. Passing tests conducted by the Nevada Highway Department on two-lane highways in December 1968 found that actual passing times and distances were almost the same for passenger cars passing a straight truck, a tractor semi-trailer, a double or multiple trailer combinations. Passenger cars were observed to accelerate to higher passing speeds as the driver became aware of the length of the unit being passed. Troutbeck in 1978 and 1979 research reports on the effects of long vehicles in the traffic stream in Australis, found that an automobile required 18% more time to overtake and pass a truck of 16 metres than a truck of 5 metres length. Trucks of 20 metres in length would require an additional 5% passing time, or 24%.

The 1977 Ontario Select Committee on Highway Safety report identified a number of concerns relating to the operation of double trailer units. These included public fears and apprehension; the tendency of the rear or pup trailer to oscillate; the lack of anti-jack-knifing devices; and offtracking or rollover in cornering. Accordingly the Committee recommended that: "the Ministry of Transportation and Communications should issue a special licence to all owners of doubles, and work with the licensed operators to establish suitable standards for their maintenance, driver control and truck loading procedures. It should be mandatory to revoke the licence if these standards are not met". The Select Committee also recommended that the Ministry of Trans-

portation and Communications should maintain the then current 65-foot length limit for trucks travelling on Ontario roads.

The Research and Development Branch of M.T.C. has recently completed a joint research project with the Roads and Transportation Association of Canada, National Research Council, Transportation Development Centre, on the B-train converter dolly. This work was initiated in response to concerns about the dolly's structural integrity and unexpected handling characteristics. The off-tracking, dynamic stability and slow speed handling characteristics of the dolly under extreme manoeuvers were tested at Centralia and at Blainville. The project was intended to test the University of Michigan Highway Safety Research Institute's computer simulation of dolly behaviour under normal load and emergency manoeuvers. The final report is expected during the spring of 1983.

The Council of Ministers Responsible for Transportation and Highway Safety endorsed a report in April 1981 by a joint committee of the Canadian Conference of Motor Transport Administrators and the Roads and Transportation Association of Canada, on Vehicle Weights and Dimensions. The report recommended that a program of cooperative research be undertaken on the effects of weights, dimensions and configurations on vehicle stability and handling characteristics. The Transport Canada Highway Transportation Research and Development Advisory Board was asked to address the subject so it established a committee with representation from manufacturers, carriers, federal and provincial governments and labour to prepare a detailed prospectus for the research. The proposed research program consists of three studies which will commence in 1984 and will take three years to complete at a cost of about $2.5 million:

(a) The effects of various vehicle dimensions and centre of gravity location on vehicle stability and safety.

(b) The handling characteristics and overall combination performance of A trains, B trains and B train converters.

(c) The effects of a variety of trailer axle configurations (spread tandems and tri-axles) on vehicle stability and road and bridge design.

4.2. Safety Standards

4.2.1. At present, the Ontario Highway Traffic Act requires every motor vehicle, other than a motorcycle, to be equipped with at least two braking systems. Each system must have a separate means of application and be effective on at least two wheels. One braking system must be adequate to hold the vehicle stationary and the other must be adequate to stop the vehicle within a specified distance while being operated on a level, dry, smooth, hard paved surface. The test may be made with the vehicle loaded or unloaded, at the discretion of the person making the test. The brakes must be adjusted so that the braking power is applied equally to the wheels on either side of the vehicle. The current U.S.A. requirements are more stringent than those in Ontario. At 20 miles per hour, straight trucks must be able to stop in 25 feet in the U.S.A. but in 30 feet in Ontario, while tractors with a trailer weighing 3000 lbs. must be able to stop in 40 feet in the U.S.A. but up to 50 feet in Ontario.

A U.S. Bureau of Motor Carrier Safety report in 1974 on the performance of a large sample of cars and trucks, both loaded and empty, found that the average stopping distance for large trucks ranged from 46% to 96% greater than cars. It was noted that truck stopping distances could be reduced 9% simply by adjusting the brakes. Consequently it was recommended that motor carriers devote more attention to brake system maintenance. The N.H.T.S.A. 1982 Causation Study notes that a current passenger car is capable of a panic stop from 60 miles per hour in less than 200 feet, but a loaded 80,000 pound truck combination requires 250 to 300 feet. Unloaded, this same combination truck still requires 250 to 300 feet to stop but the tractor alone ("bobtailing") requires 300 to 500 feet. Although trucks have greater stopping distances than passenger cars, the better vision of truck drivers due to their greater height above the roadway may allow them to anticipate potential hazards from a greater distance, and they may begin to decelerate or take other evasive action much earlier than passenger car drivers.

Recently N.H.T.S.A. has added the requirement that all wheels be equipped with brakes, to prevent manufacturers and carriers from leaving brakes off the front steering axles of three-axle tractors. This practice is still permitted in Canada because brakes are not required on all wheels under Canadian law. In addition, Canadian trailer manufacturers may be building trailers which have slower brake systems than are accepted in the U.S.A. There is still some controversy regarding the amount of braking force needed on the steering axle. It has been argued that too much brake force on the steering axle may be as dangerous, or even more so, than not enough braking force. However, during the summer of 1981 Transport Canada ran tests at the Blainville Test Centre in Quebec and found that a three-axle dump truck, without front brakes, has 30 per cent longer stopping distance than a similar vehicle with front brakes

Similar tests were planned for the summer of 1982 employing three-axle tractors.

The braking system of trucks is critical to their safe operation. An optimum system should operate effectively when the vehicle is loaded or empty and under various road, traffic and weather conditions. Ideally, all motor vehicles should be able to stop within approximately the same distance at a given speed; however, brake technology for trucks has not advanced to the point which allows them to stop as quickly as cars. A number of factors influence braking effectiveness, including gross weight, brake imbalance, road friction and tires. Pneumatic tires require rolling motion to maintain directional stability. Straight trucks, like passenger cars, can lose directional control during braking in two ways: the front wheels may lock up and skid, the vehicle becomes unresponsive to steering and continues straight ahead; or the rear wheels may lock up, skid, and the rear end swings rapidly forward.

Power brake systems, such as air-brakes, do not provide the driver with a significant "feel" as to the amount of brake application required. The driver has no measure of how much air pressure he has put into the brake system and cannot judge whether the wheels have locked. In tractor-trailer combinations, the worst braking condition is generally considered to be when the drive wheels of the tractor are locked. Wheel lock-up is much more frequent in an empty truck with lightly loaded drive axles, especially on wet, snowy or icy roads. Heavier trucks can experience heat buildup and subsequent brake failure. It has been estimated in the 1982 U.S. Causation study that as many as fifty drivers of large trucks are killed each year in the U.S.A. in runaway truck accidents and, in many cases, truck runaway is the result of poor brake maintenance, poor brake adjustment or improper use.

4.2.2. Effective January 1, 1975, the N.H.T.S.A. required all new trucks and trailers in the U.S.A. to be equipped with an anti-lock air brake system. This standard applied to all new trucks of 20,000 pounds or over. The revised standard was introduced because too many trucks were involved in rear-end collisions with other vehicles. The stopping distances allowed for trucks in the U.S.A. before 1975 were over double those for passenger cars. The new standard became known as the "121" brake standard and it reduced the allowable truck braking distance to about 10% greater than that for passenger cars. The 121 antilock system controlled the air pressure at individual wheels by monitoring the speed of wheel rotation by electrical means. This system released the air pressure sufficiently to allow the wheel to roll at a point close to the incipient skid. Shortly after its introduction in the U.S.A., Transport Canada proposed the same standard for Canada but several provinces, including Ontario, and trucking associations opposed the full 121 brake standard because of insufficient testing of the system's

reliability under all conditions of operation, and because of early design problems. It was thought that the Canadian climate of frost and snow could affect the system adversely. As a result of this opposition, TRansport Canada introduced only a partial 121 air-brake standard which did not include maximum stopping distances, the anti-lock feature or brake actuation and release times. As a result of successful court action brought against N.H.T.S.A. in 1978, the U.S.A. Federal Government has since removed the stopping distance requirements and anti-lock feature but it has retained the brake actuation and release time provisions.

The Research and Development Branch of M.T.C. conducted its own evaluation of the 121 standard. They found that reservoir pressure and brake adjustment were critical, that the present methods of balancing the brakes on articulated vehicles are not satisfactory, and that improper installation of air line components can adversely affect the timing. In Ontario there are no air brake timing specifications for articulated vehicles and the Research and Development Branch believes that there should be. While all tractors equipped with air brakes are also equipped with spring or emergency brakes, not all air-braked trailers have spring brakes. In the research report: Commercial Vehicle Accident Survey -- an On-the-Scene Study, 1982, investigators from M.T.C. noted that the use of spring or emergency brakes was NOT recommended by a number of combination truck drivers and fleet supervisors, and drivers were often instructe to use these brakes only when parking the truck. The M.T.C. Truck and Bus Driver's Manual recommends that "if the brakes should fail on a level road, drivers should downshift and use engine compression to slow the vehicle. If a shorter stopping distance is necessary, they should use the tractor and trailer emergency brakes, if fitted, to stop the vehicle". The M.T.C. on-the-scene accident investigators examined three truck accidents involving brake failure. In each of these accidents, the driver had made no attempt to slow or stop the vehicle by using the emergency spring brakes and, in each case, the severity of the resulting collision could have been substantially reduced had the spring brakes been employed. In general, it is better to employ the emergency brakes than not.

As the demands for more fuel-efficient trucks increase, so will the demands on the braking system, since many of the methods used to increase fuel efficiency are based on decreasing the air, rolling and mechanical resistance of the truck. This increases the braking force needed, especially when going downhill. Transport Canada is conducting a series of tests to determine the effects of various combinations of commercial vehicle brake anti-lock system on the axles of different truck configurations, including B-train doubles and A-trains. This research is expected to continue at least through 1983. Transport Canada may ultimately want to regulate anti-lock on the drive axles of new tractors.

4.2.3. Many people believe that tire failures are second only to brakes as the cause of highway accidents. In actual fact, tire failures constitute less than one per cent of truck accidents according to the M.T.C. Commercial Vehicle Accident Survey in 1981 and to the U.S. B.M.C.S. However, tire tread, design and condition do affect the stability of commercial vehicles and, like cars, a blowout on the front steering axle of a truck can cause loss of control. A tandem axle is more stable because the adjacent wheels take the load if a failure occurs. Over-inflation of truck tires tends to push out the flat face of the tire tread and reduces the contact surface of the tread which causes excessive wear in the centre of the tire. Under-inflation of truck tires allows the side walls to sag or buckle, permitting the centre of the tread face to cave inward which causes excessive wear on the outer edges of the tire. Both the heavier loads carried and improper inflation of truck tires, cause the tires to run hot and the heat can be intense enough to cause a blowout or a fire. The Commission was told that some truckers put tires with worn tread on the trailers because the consequences of a blowout are less on the trailer than on the steering or driving axle of the tractor.

The Ontario Highway Traffic Act requires all motor vehicles and all trailers having a gross weight in excess of 1,820 kilograms to be equipped with rubber tires or tires of some composition equally resilient. No person is permitted to operate a vehicle that is fitted with a tire that does not conform to the standards and specifications prescribed in the Regulations 741/81:

(a) A tire shall have no exposed cord cuts or abnormal bulges.
(b) A tire shall not be worn to the extent that less than 1.5 millimetres of tread depth remains.
(c) A front tire on a motor vehicle having a gross vehicle weight of more than 4,500 kilograms shall not be worn to the extent that less than three millimetres of tread remains.
(d) Tires shall be installed on a vehicle so as to avoid mixing types or sizes.
(e) A tire fitted on a vehicle shall not be of a smaller size than the vehicle manufacturer's specified minimum.
(f) Studded tires are prohibited from use on a highway.

In Canada new tires are controlled under the Canadian Motor Vehicle Tire Safety Act but the control of regrooved and retreaded tires is the responsibility of the provincial governments in Canada and the Federal Government in the United States. In the United States, retreaded passenger car tires must meet Federal Motor Vehicle Safety Standard 117. Retreaded tires are required to meet safety criteria similar to those prescribed for new passenger car tires except for the high speed and endurance requirements. However, the present police motor vehicle accident report does not identify whether failed tires

were rebuilt and so little reliable information is available in Ontario.

The Ontario Highway Traffic Act defines "rebuilt" to mean: to make or impose a new surface or to otherwise alter the surface of a used tire so that it will resemble a new tire, by cutting into or adding rubber to the surface or by a combination of both. All retreaded and regrooved tires must be identified with the word "rebuilt" clearly embossed upon or cut into the outside surface of each wall of the tire, in letters not less than six millimetres in height. The Ontario Regulation 741/81 prohibits the transfer of a used motor vehicle that is equipped with tires which have been regrooved or recut below the original new tire groove depth, other than tires specifically designed for such recutting and so marked. The use of rebuilt tires is prohibited on the front wheels of a school bus. Three years ago the Canadian Standards Association developed a retread tire standard for both passenger car and non-passenger cars. The C.S.A. standard was based on the U.S. Federal Motor Vehicle Safety Standard 117 and Quebec's regulation for passenger car retreads. Ontario has not adopted the C.S.A. standard because there has been little pressure to do so and supporting accident statistics are lacking.

The Ontario Trucking Association, in their brief to the Commission, report that they have received very few complaints about retreaded truck tires, and most of their members use these tires. Manufacturers' warranty records were reported as indicating that the operating performance of retreaded tires was as good as, if not better than, that of original tires. The truck tire remains often seen along the roadside of Ontario's highways are generally caused by under-inflation and not because of improper manufacture. Blowouts are usually caused by a combination of poor tire inflation and tire over-loading. The O.T.A. were surprised that the C.S.A. standard for retreaded tires was not adopted in Ontario and feel that it should have been.

Generally, increasing the weight on a tire increases its tractive ability, so a heavier loaded tire may have greater resistance to skidding than a more lightly loaded tire. When more weight is placed on the steering axles, the tires tend to maintain their direction and resist skidding. While an increase in the truck's gross weight benefits its stability, the benefit is offset by the greater distance required to bring it to a stop. Standard size passenger cars can hydroplane on wet surfaces at speeds as low as 30 miles per hour. Large truck combinations, with their higher pressure tires, do not hydroplane at normal traffic speeds. A U.S. N.H.S.B. 1969 Staff Report entitled: Maximum Safe Speed for Motor Vehicles, notes that "a special hazard arises when a hydroplaning passenger auto is trailing a large motor vehicle, such as a large truck or bus, which is decelerating to a stop. Large motor vehicles, being equipped with tires requiring much higher inflation pressure than usually found on automobiles, are not likely to be hydroplaning. Thus, unless the separation distance is very

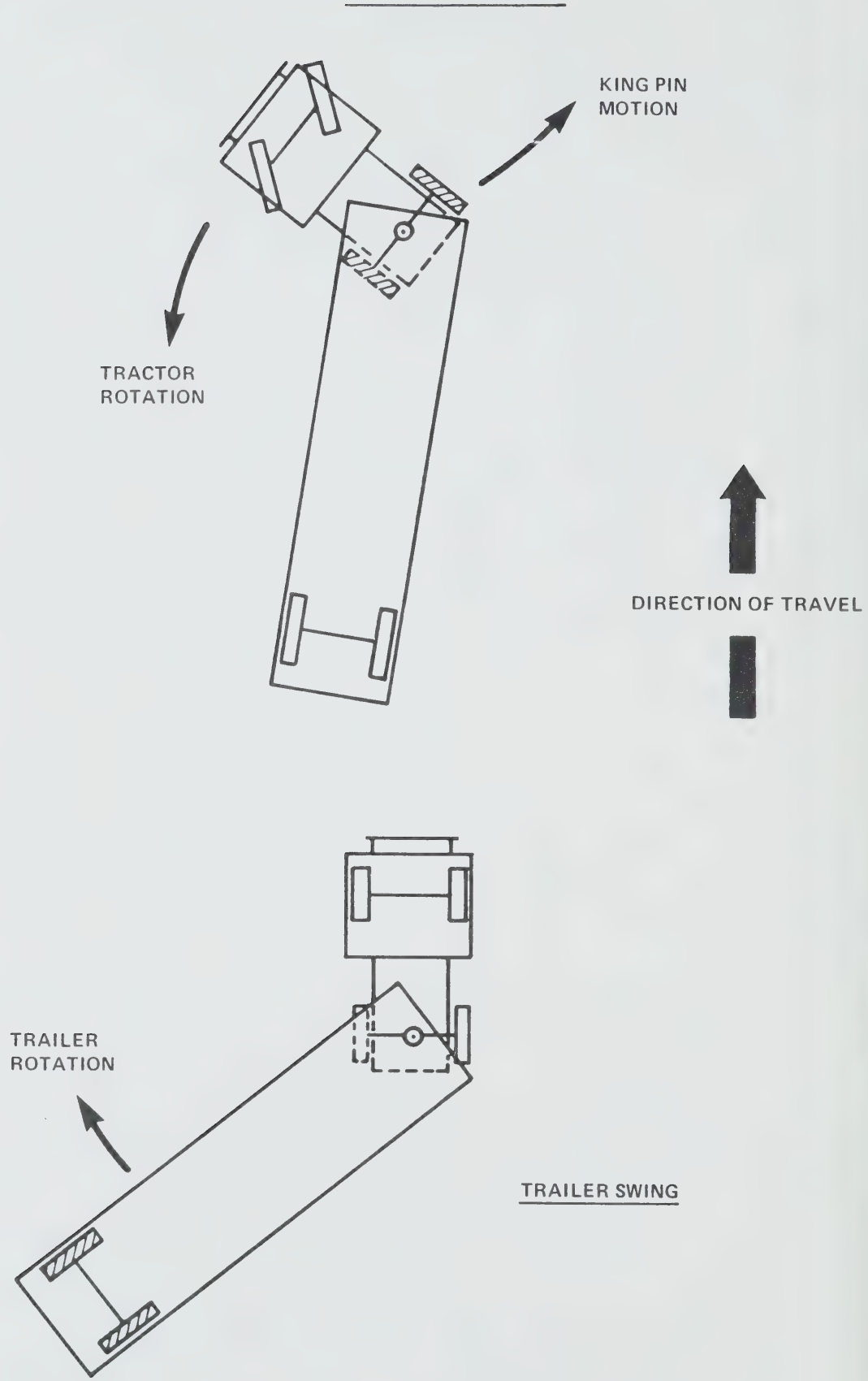
much larger, about three-fold, than would be ordinarily allowed for safe stopping, the smaller vehicle will collide with the larger vehicle". This may cause more accidents than do blowouts. On wet surfaces, trucks with more axles enjoy a traction advantage over motor vehicles with fewer axles because the steering axle and drive axle on wet pavement squeeze much of the water out of the path of the following axle which, in turn, makes the path of the next following axle a little drier. The axles of the rear trailer, when braked, may be on a surface with a much higher coefficient of friction. This results in shorter braking distances and greater stability.

4.2.4. There are four types of dynamic instability which can occur in heavy articulated trucks: tractor jack-knife; trailer swing; rollover and trailer sway. In articulated vehicles, jack-knife occurs when tires on the rear axle of the tractor skid sideways which results in a rapid and violent rotation of the tractor through approximately 120 degrees about the "fifth wheel" (see Figure 9). The rotation takes only one or two seconds and the oncoming trailer may strike the tractor cab. It can be caused by too much braking or by too much engine torque. Trailer swing occurs when the tires on the trailer skid sideways and the trailer swings right or left about the fifth wheel. It is slower but extremely dangerous and dramatic because the trailer may cross several traffic lanes, wiping out other vehicles. It happens most often during braking on a downgrade. Skilful drivers may be able to accelerate and steer out of this type of instability provided there is nothing in their way. Jack-knifing and trailer swing may occur in routine turning, even in the absence of braking, if the radius of curvature of the turn decreases.

A truck is more likely to roll over than an automobile because it has a higher centre of gravity. Rollover occurs when the inertia forces at the centre of gravity and the lateral forces being generated at the tires produce a torque exceeding the counter-balancing torque of the vehicle's mass acting at the centre of gravity. So it depends on the load and its distribution, tire pressure, width of the vehicle, as well as speed, curves and manoeuvering. Trucks can rollover more easily than cars, even in steady turns, because the "rollover threshold" is low. The threshold is expressed in terms of the acceleration due to gravity g, and in general it is less than one-half g for trucks but over one g for automobiles. Heavily loaded commercial vehicles rollover more easily than those which are empty or lightly loaded.

Trailer sway is a problem exclusive to commercial articulated vehicles (C.A.V.). It is a side-to-side oscillation of the last trailer of a combination. When truck combinations make rapid lane changes, the sidewise movement of the rearmost trailer is greater than that of the tractor and other trailers, especially if it is more heavily loaded then the others. In emergency manoeuvers,

FIGURE 9



Jackknife Modes

Source: Ontario Ministry of Transportation and Communications, Performance Evaluation of Several Jackknife Control Devices, 1980, Report CVOS-TR-80-03

the whipping motion may be amplified enough to cause the rear trailer to rollover. The M.T.C. Research and Development Branch has conducted studies of the relative stability of A trains vs. B trains and extensive research has been done by the University of Michigan Highway Safety Research Institute. Presdnt evidence is that B trains are more stable than A trains.

Of all the C.A.V. accidents investigated by the M.T.C., 28% were jack-knifes, 16% were rollovers, 16% were skids, 6% were loss of direction and 3% involved trailer swing. The survey took place during winter months under poor highway conditions. Of thirty accidents involving C.A.V.'s, 18% occurred on curves and 9% were on ramps. Bondy and Partha in 1980, found that 56% of the fatalities to the drivers of C.A.V.'s were due to rollovers and 56% of the injuries were incurred in jack-knifes.

4.2.5. Anti-jack-knife devices are devices designed to control tractor-trailer jack-knifing or trailer swing and have been available for a number of years. There are three general types:

(a) those designed to prevent excessive rotation of the tractor about the fifth wheel by the use of chains, cables or metal stops.
(b) those designed to tighten or freeze the hinge at the fifth wheel kingpin.
(c) those designed to prevent wheel lockup during braking (see Section 4.2.2.)

In 1976-77 the M.T.C. Research and Development Branch conducted an evaluation of four anti-jack-knife systems at Centralia, Ontario, with the cooperation of Transport Canada. The study was published in 1980 and concluded that wheel anti-lock systems were the best because they try to eliminate the fundamental cause. M.T.C. officials believe that a properly adjusted anti-lock system prevents jack-knifing at the highest speeds but the trucking industry is reluctant to use them because they are very complex. During the visit to the Blainville test centre of Transport Canada, the Commissioner witnessed some tests where a supposedly satisfactory anti-lock device failed to work and a jack-knife was prevented only by a secondary cable system. The Ontario Select Committee on Highway Safety identified this problem in 1977 and noted "that although extensive research has been done, no proven anti-jack-knife devices have been introduced and that at best, devices may slow down the motion sufficiently to enable to driver to steer out of it. They rely on the driver's ability to sense the jack-knife motion early enough to avoid it". The situation has not improved since then.

4.2.6. Car into truck under-ride accidents have concerned motorists, the trucking industry, truck manufacturers and governments for some time. The accidents are usually quite severe and attract a good deal of attention. However the accident statistics vary widely. The U.S.A. National Accident Sampling System

in 1979 reported that under-riding was involved in only 2% of all truck accidents and in 6% where fatalities occurred, but in 1977 the report entitled: Fatal Car-into-Truck/Trailer Under-ride Collisions, by Minahan and O'Day at the University of Michigan reported that 18% of the fatal collisions involved under-ride. Under-ride fatal crashes occurred predominantly at night in poor visibility and, surprisingly, bad weather was only a minor contributing factor. The impact speed was greater than 30 miles per hour in most of the collisions, and tractor-trailers outnumbered straight trucks two to one. In rear end collisions, the truck had often stopped for a signal or was waiting to turn. In side collisions, the trucks were astride the road because of jack-knifing, were making a left turn or were using a ramp or driveway. The truck driver was relatively immune to injury. The study concluded that under-ride protection devices could reduce, but not eliminate, fatal car-into-truck collisions, depending on whether they were rigid and unyielding or yielding and energy absorbing.

Energy absorbing guards can be quite effective in dissipating the energy of a crash but they are generally complex, heavy and costly. Energy absorbing guards are more available in the U.K. and in Europe and in Australia where their effectiveness has been demonstrated, but it is still controversial whether hydraulic guards are more or less effective than deformable guards.

There are problems in deciding what the best height above ground should be for under-ride protectors. An unsuitable rear bumper on a truck may be more dangerous than the back of the truck: if it is too high, it may decapitate the driver of a small passenger car; if it is too low, it may be an obstacle to manoeuvering. In 1953 the U.S.A. F.H.A. permitted 30 inches at the rear of a truck and required no protectors at the sides. In 1969 it was decided to upgrade the requirements but it was cancelled in 1971 because of objections from truckers about excessive weight. In 1981, N.H.T.S.A. proposed guards of moderate strength and 21 inch ground clearance which would extend across the rear of a truck or trailer to within four inches of each side. A great variety of under-ride guards exist and are generally made for specific vehicles. Their ground clearance varies between 24 and 27 inches.

4.2.7. The Ontario Highway Traffic Act specifies where and when lamps are require on motor vehicles. The regulations cover rear lights, parking lights, warning lights and flares, and colours. The Canada Motor Vehicle Safety regulations specify comprehensive requirements for <u>new</u> vehicles, but they may not continue to apply after a vehicle has been sold. The Commission was told that not all operators keep the lamps and reflectors operational if they are not covered by the Ontario H.T.A. For example, it is not legally possible in Ontario to require truck operators to maintain the side marker lamps and reflectors, even though these are required federally.

In a 1979 report entitled: Car-Truck Fatal Accidents in Michigan and Texas, Minahan and O'Day found that under-ride accidents frequently occurred at night and they concluded that enhanced conspicuousness of trucks and trailers would reduce night-time car-truck accidents by allowing the drivers time to perform evasive manoeuvers. Trucks over three tons unladen weight have been required to display distinctive rear markings in England since November 1971, including a yellow reflective material for night-time and red fluorescent material for the daytime. A 1976 British Transport and Road Research Laboratory report entitled: The Effect of Rear Markings on Rear Impact Accidents Involving Heavy Goods Vehicles, evaluated the effectiveness of the British rear marking requirements. The study found that after introduction of the markings, a statistically significant reduction occurred for night-time rear end accidents on unlit rural roads involving parked trucks.

A 1979 study by Lum for the U.S. F.H.A. entitled: Evaluation of Techniques for Warning of Slow-Moving Vehicles Ahead, and a study by Knoblauch and Tobey in 1980 entitled: Safety Aspects of Using Vehicle Hazard-Warning Lights, measured the effectiveness of four-way flashers on slow-moving trucks on grades. The results of both studies concluded that roadway signs were ineffective but four-way flashers on trucks were effective both during daylight and night hours in reducing the risk of rear-end collisions.

4.2.8. Both Canadian and United States Federal Governments have enacted motor vehicle safety standards regulating noise emissions at time of manufacture or importation. The Ontario H.T.A. requires every motor vehicle to be equipped with a muffler in good working order to prevent excessive or unusual noise and excessive smoke. The Canadian Federal Motor Vehicle Safety Regulations require every vehicle to be so constructed that the noise emitted by it in the case of heavy duty vehicles not exceed 88 decibels and, in the case of light duty vehicles and off-road utility vehicles, not to exceed 86 decibels. In 1975 the U.S. F.H.A. prescribed Interstate Motor Carrier Noise Emission Standards. The maximum permissible exterior noise level ranges from 84 to 95 decibels. The U.S.A. Federal Motor Carrier Safety regulations limit the interior sound level at the driver's seat to no more than 90 decibels, and the U.S.A. Federal Environmental Protection Agency prescribes a maximum allowable exterior noise level of 83 decibels at the time of manufacture.

The Ontario Ministry of Labour is currently proposing new allowable noise legislation. It is expected that truck drivers will fall under a general class of on-road workers. The new noise requirements will define noise as a sound above 80 decibels and it is expected that the maximum allowable noise for truck drivers will be 90 decibels. The trucking industry has made representation for a special allowance for truck drivers because the new standard will be diffi-

cult to control. Construction workers are at present given special consideration due to the noise control problems associated with their workplace, so the Ministry of Labour is considering a similar provision for truck driving.

The current Occupational Health and Safety Act and Regulations for Industrial Establishments require that measures be taken to reduce the sound level to below 90 decibels. Where a worker is exposed to a sound level of 90 decibels or greater, the regulations require that a worker shall not be exposed for the period of time set out in Table V. Otherwise the person must wear hearing protection. There was some question as to whether this applies to truck drivers.

TABLE V

PERMISSIBLE SOUND LEVELS

Column 1	Column 2
Sound Level in Decibels	Duration - Hours per 24 hour Day
90	8
92	6
95	4
97	3
100	2
102	1½
105	1
110	½
115	¼ or less
Over 115	No exposure

There are several major sources of noise in motor vehicles: engine, exhaust, cooling system, tires and wind. The level of noise is influenced by the vehicle speed and load, the road surface, and both the tire tread and pressure. Articulated trucks produce an average of two decibels more than straight trucks. Tetlow reported in the Journal of Sound and Vibration in 1971 that there is a two decibel increase for each doubling of the number of axles or tires.

Truck noise, size and vibration contribute to the passenger car driver's fear, anxiety and stress. Highway traffic noise is becoming a more serious problem in urban areas. This problem is expected to increase as the number of motor vehicles, particularly trucks, increases. The combination of bigness, noise and vibration creates an adverse psychological effect on motorists.

The Commission has heard statements from several medical sources that the varying degrees of heat, noise and vibration that truck drivers are subjected

to is likely to increase fatigue. Mackie, O'Hanlon and McCauly in a 1974 report entitled: A Study of Heat, Noise and Vibration in Relation to Driver Performance and Physiological Status, noted that truck drivers tend to suffer some temporary loss of hearing at high cab-noise levels, and this decreased driver alertness and increased driver fatigue. Dr. William Ghent, Chairman of the Council on Health Care, Canadian Medical Association, noted at the Ottawa Commission public hearing that the truck driver's physiologic reaction to cab noise has not been dealt with in the C.M.A. Guide for Physicians in Determining Fitness to Drive a Motor Vehicle, but that it deserves attention. The C.M.A. brief was reviewed by the Hamilton-Wentworth Council on Road Trauma (a council of physicians interested in road accidents) and by three local coroners. These physicians agreed that research was required into the effects of cab noise on driver performance.

While truck noise is a common complaint, especially on higher speed highways in Ontario, the solution to the noise control problems may require trade-offs. For example, the noisiest truck tires may provide the best traction and wear resistance. Additional installations to reduce engine noise may reduce air-flow and create problems of overheating. The added weight of the noise control equipment might reduce carrying capacity and increase fuel consumption.

For about ten years, several countries in Europe and America and Japan have been investigating large truck noise reduction. In addition, some research has been done by the vehicle manufacturers. It is generally agreed that noise reduction will be more effective if integrated into the total vehicle design rather than retro-fitted on existing equipment, and the cost would probably be lower for newly designed vehicles as well. A research project on the feasibility of designing and making a quiet heavy goods vehicle was started in 1971 in the British Transport Road Research Laboratory. Two experimental vehicles were built and demonstrated in 1978, the external noise was measured at up to 81 decibels and the interior cab noise at 72 decibels. Similar research is now being conducted in the United States. Highways could be designed and located so as to minimize traffic noise by using by-pass routes, appropriate road surfaces and sound-absorbing structures.

4.2.9. The Ontario H.T.A. prohibits any motor vehicle or trailer from being operated on a highway unless the load that the vehicle or trailer is carrying is: "firmly bound, sufficiently covered, or otherwise secured or loaded in such a manner that no portion of the load may become dislodged or fall from the vehicle or trailer". Regulation 455 deals with the covering of loads of sand, gravel, crushed stone, etc. and Regulation 428 deals with load security. Similar regulations apply in the U.S.A. under Section 392 of the Federal Motor Carrier Safety Regulations. Drivers are required to examine the cargo for security before commencing a trip and at specified intervals during the trip.

The Commission received complaints about load security of lumber, scrap haulage and animals because these cargos shift their centre of gravity easily. Some animals roll over when a truck rounds a curve unless they are in pens. Complaints were also received that the load security requirements were not being enforced, but the O.P.P. disagreed. In the U.S.A. it was reported (Valette 1980) that only 1% of the accidents investigated involved cargo shift but 2% were due to spillage of cargo before the accident. The Ontario M.T.C. found that approximately 6% of the accidents investigated during 1979-81 had improper or inadequate load security and observed that the load should be restrained from movement in any direction because if it begins to shift, the securing devices may not hold. The number of accidents due to load insecurity is not very well known because the current Ontario Police Motor Vehicle Accident Report makes no provision for describing the status of load security. The Ontari Forest Industries Association at the Thunder Bay hearing reported that encasing lumber loads was most impractical and recommended that illuminated "lay bys" be provided for government load check points.

4.2.10. The Commission received many complaints from motorists about the relatively slow speed at which some trucks climb hills. Some motorists become frustrated by lines of traffic behind a slow truck and take great risk in trying to pass, especially on two lane highways. If an accident results, the culpability of the slow moving vehicle is questionable but the accident might have been avoided if the slow truck had had sufficient power to maintain normal speeds. Many motorists also complained that the same truck would speed excessively on the downhill side in order to make up the lost time and to gain momentum for the next climb. On multi-lane highways the truck may pass but on two-lane highways it may tailgait the motorist until an opportunity to pass occurs. Again, there is great risk of an accident. In general, the greater the speed differential between vehicles, the higher the risk of an accident.

The ability to maintain pace with the traffic requires adequate engine power for the gross weight of the truck. In 1970 the U.S. N.H.T.S.A. proposed a regulation which would have required heavy trucks to have a minimum horsepower-to-weight ratio, but because of objections from the trucking industry, the N.H.T.S.A. withdrew the proposal. Many states have tried to introduce similar regulations but they failed because there are other factors involved besides power-to-weight ratios, such as the type of engine and gear and axle ratios. Most provinces and states have traffic laws which require slow moving vehicles to drive on the right side of the road and to pull over at the first opportunity to allow other vehicles to pass. Some jurisdictions have set minimum speed limits as well as maximums. Ontario has built truck climbing lanes and passing lanes and has restricted trucks to specific lanes

on certain stretchds of highway, with the result that roadway capacity has increased and accident rates have been reduced a little.

4.2.11. There are two widely-used tractor types: the conventional cab-behind-engine (C.B.E.) and a cab-over-engine (C.O.E.) The latter were developed to maximize cargo space within the overall length restrictions. Thus the C.O.E. has a shorter wheel base than the C.B.E. to permit longer trailers to be hauled. In Ontario, double trailers are most often towed by C.O.E.'s. The O.T.A. stated that conventional C.B.E. tractors are inherently more stable than the short wheel-base C.O.E. tractor and this was supported by the Manitoba Trucking Association. Several truck drivers told the Commission that C.O.E. tractors were noisier and hotter, and the excessive vibration discouraged the use of seat belts. Many studies, such as that of the University of Michigan, H.S.R.I. by Kubachi and O'Day, 1981, have found higher rates of injury and fatalities per accident for the drivers of C.O.E.'s. Campbell and Carsten in 1981 found that the driver fatality rate for C.O.E. tractors was more than double that for C.B.E. tractors.

The Ontario and Manitoba Trucking Associations recommended that the Province of Ontario adopt a 23 metre length for double trailer truck combinations as is now permitted in the provinces of Manitoba, Saskatchewan, Alberta and British Columbia. There is usually a restriction that the distance from the king-pin to the rearmost trailer must be less than 16.7 metres. This would permit the use of more stable C.B.E. tractors.

4.3. Vehicle Maintenance

4.3.1. There is an identifiable relationship between good maintenance for large trucks and a reduction in truck accidents (McDole and O'Day, 1975). Li et al (1979) reported that trucks transporting hazardous materials which were involved in accidents had a higher proportion of vehicle defects. Proper maintenance of these trucks is essential, given that their involvement in an accident has potential catastrophic consequences. Based on an analysis of over 22,000 North Carolina chauffeur licensees, the study found that poorly maintained vehicles are more likely to be driven by persons with poor driving records, (i.e. multiple accidents, convictions). The leading defective conditions of large trucks involve brakes, tires, wheels and lights. An adequate inspection and maintenance program serves to prevent breakdowns and allow for quick detection and repair of defects.

The Teamsters' submission to the Commission noted that minor vehicle defects may go unreported in cases where vehicles are used by many different drivers. Union agreements usually contain a clause which protects drivers from having to operate unsafe vehicles, and a clause making it the employee's duty to report all defects in writing on a form supplied by the company. The Teamsters' submission recommends that maintenance and repair records should be standardized, and such documentation should remain with the vehicle at all times. The O.P.P. submission to the Commission stated that many companies are reducing preventive maintenance and operating their vehicles until components fail or wear out completely, before making repairs. This is attributed to the increasing costs of parts and labour.

The Ontario Select Committee on Highway Safety noted in its final report that researchers, government personnel and industry people agree that large fleet operators maintain their vehicles more carefully than other operators. The O.T.A. submission made reference to the great variability in maintenance and inspection practices within the trucking industry. The larger carriers tend to perform complete inspections each time a unit is dispatched for a trip, while small operators find frequent checks to be financially and operationally burdensome, especially for those without in-house facilities. The O.T.A. favours implementation of a periodic truck inspection program and recommends that:

"All inspection or repair work performed should be recorded on work orders signed by the mechanic and supervisor. The journeyman's licence number of the mechanic performing such inspections or repair work should be clearly displayed on all work orders."

Further, the O.T.A. recommends that:

"All (commercial) vehicle owners, including those not classified as vehicle operators, should be required to maintain records of all inspections

and repair work done on all vehicles owned by them, for a period of at least three years."

Independent owner-operators are responsible for maintaining their own vehicles. They do not have the in-house maintenance facilities and personnel of the large carriers so they must take their trucks to public service garages, or attempt to perform their own maintenance and repairs. It was suggested that some owner-operators are reluctant to take time out from a busy on-road schedule to perform preventive maintenance, or that they are financially constrained to the point where they cannot afford needed repairs. However, these arguments against independent operators are largely speculative with little factual evidence. Since the operation of a truck represents a large investment and is the means of livelihood for the owner-operator, it is economically beneficial to maintain the vehicle in safe running order. Unlike the trucking companies, the independent must act as management, driver, safety supervisor and salesman all in one.

McDole and O'Day (1975) reported that maintenance practices in the trucking industry fall into three categories:

(a) Sophisticated maintenance systems which include advanced detection procedures such as computer records of component use and replacement,
(b) Adequate maintenance systems where most breakdowns are prevented through a day to day detection of defects,
(c) Breakdown maintenance system where repairs are made only upon failure or breakdown of the truck while in operation.

There are several excellent sources of inspection and maintenance guides:

(a) "Recommended Inspection Procedure and Pass/Fail Criteria for Articulated Vehicles and Straight Trucks" February 1977, prepared jointly by M.T.C. and O.T.A.
(b) "Truck/Bus/School Bus Vehicle Inspection Handbook" (1981 Edition), prepared by the Engineering Division of the Motor Vehicle Manufacturers Association (M.V.M.A.) in cooperation with the American Association of Motor Vehicle Administrators (A.A.M.V.A.).
(c) California Highway Patrol Critical Item Truck Inspection Guide - A Supplement to Preventive Maintenance.

Trailer maintenance is generally neglected in comparison to tractors. Whereas tractors are usually domiciled in specific terminals and often operated by a limited number of drivers, trailers may be hauled from one terminal to another. The driver may be more concerned with the mechanical fitness of his tractor than with a trailer that he hauls for a single trip and then leaves for another driver. The M.T.C. vehicle inspection program shows that trailers have 50% more defects than tractors, and brake deficiencies are dominant.

4.3.2. A driver's pre-trip inspection of his vehicle is the last chance to detect unsafe conditions before the truck heads out on the road. Trucks which are not scrutinized for mechanical fitness before going out on the road run the risk of having unsafe conditions develop into critical situations. Driver post-trip inspections are equally useful in that problems which became evident during the trip can be turned over to the maintenance department which can deal with the defect before the unit is dispatched for its next trip. The O.T.A. included a concise vehicle pre-trip inspection guide entitled: The Circle Check, a 6-by-6 Systematic Check for Vehicle Roadworthiness (see Fig. 10) which is a good example for drivers to follow. Monitoring of the mechanical condition of the vehicle does not end with the pre-trip inspection. Periodic checks should be carried out during the trip, at meal or rest stops and every few hours after long stretches of continuous travel. The Ontario Petroleum Association has a similar procedure.

Under the U.S. Federal Motor Carrier Safety Regulations (F.M.C.S.R.) all trucking operations subject to the Bureau of Motor Carrier Safety (B.M.C.S.) are required to conform to specified pre- and post-trip vehicle inspections. Any problems must be reported to maintenance personnel and corrected before the driver and his vehicle are dispatched. At the end of each trip, the driver is required to report any defects identified during the trip on a written vehicle condition report, which is used by maintenance personnel to effect repairs before the vehicle is dispatched again.

4.3.3. The Ontario Petroleum Association (O.P.A.) noted that all its member companies are dedicated to a preventive maintenance program, designed to inspect and repair all components of the vehicle on a planned time or distance interval. The intervals typically used are 10,000, 30,000 and 90,000 kilometres. These three cycles are referred to as A, B and C schedules respectively. In addition, there is also a "spring and fall" schedule (D). Shop maintenance should be conducted by qualified mechanics and technicians, either in-house or by establishments which provide such services to operators. Only the carriers which maintain large fleets can afford their own maintenance department, complete with full equipment and skilled personnel.

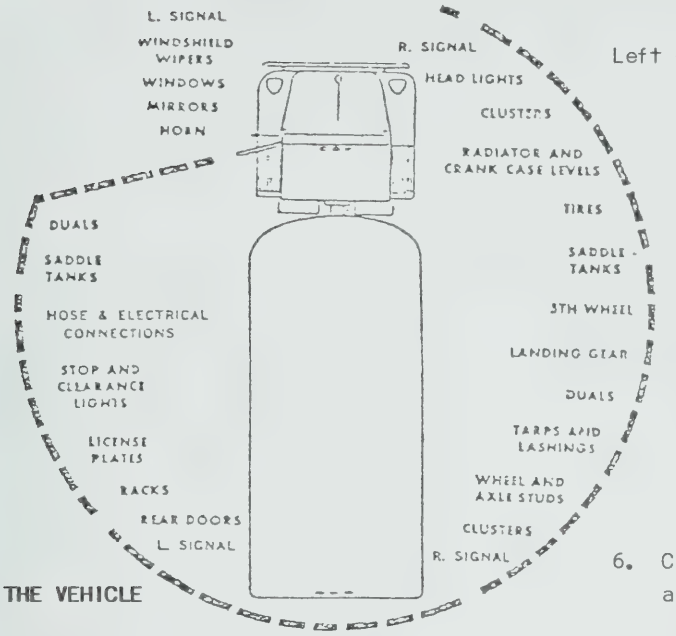
Under the U.S. F.M.C.S. Regulations, truck operators must maintain a systematic maintenance program including records of servicing at the principal place of business. In California, Highway Patrol inspectors audit terminal maintenance shops to check that proper maintenance and record keeping are performed by the owners of heavy trucks. Operators who develop a poor safety record are audited most frequently. The importance of effective maintenance and the theme of owner responsibility for maintenance is emphasized by the inspectors.

The O.T.A. submission noted that responsible carriers inspect equipment on a regular basis and repair defects as they develop. This is done to reduce

FIGURE 10

THE CIRCLE CHECK

A "6-by-6" Systematic Check for Vehicle Roadworthiness



Left - This drawing shows a general method of making a systematic circle check before taking out a truck at the beginning of a day's work. Details of the check can, of course, be varied according to the type of vehicle, but generally the principal of making a complete circle should be followed in all cases.

Some of the points to look out for are given in the sample "6-by-6" check below.

ROUND THE VEHICLE

1. Check vehicle for unrepaired damage to lights, clearance clusters, bumpers, fenders, mud flaps and signal lights.
2. Check all tires for inflation and missing valve caps.
   Check wheel lugs and nuts.
3. Check springs for sag and U-bolts for tightness.
4. Check rear view mirrors and mirror mountings - operation of doors, door handles and latches.
5. Check fuel tanks and fuel level, air vent and properly locking cap.
6. Check tarps, lashings, tailgates, rear doors and signal lights.

IN THE ENGINE COMPARTMENT

1. Check radiator for leaks, coolant level and properly locking cap.
2. Check fan for bent blades, loose mountings and belt tension.
3. Check oil level.
4. Check battery for electrolyte level, cracks, excessive corrosion.
5. Check air cleaner for proper attachments.
6. Check quickly for obvious breaks or loose connections in electrical system, coolant hoses and vacuum hoses.

IN THE CAB

1. Check fuel and lash of brake pedal and clutch pedal
2. Check hand brake for excessive travel and locking ability.
3. Check horn and windshield wipers.
4. Check fuel gauge and ammeter.
5. Check adjustment of rear view mirrors.
6. Check operation of all lights - by getting in and out of the cab, or by getting a helper.

WITH ENGINE STARTED

1. Check engine for ease of starting and smooth operation.
2. Check operation of hand throttle, choke and accelerator pedal.
3. Check brakes of air or vacuum operated type.
4. Check operation of all instrument panel gauges.
5. Check operation of windshield wipers.
6. Check for unusual noise in clutch and transmission when clutch pedal is depressed and released, with engine running, and transmission in neutral.

FIFTH WHEEL

1. Check fifth wheel mounting.
2. Check operation and position of fifth wheel locking handle.
3. Check locking block to make sure it's engaged.
4. Check lower coupler plate for proper connection and condition.
5. Check brake hoses and electrical cord for proper connection and condition.
6. Check light cables for connection and condition.

EXTRA EQUIPMENT

1. Fire Extinguishers and Flares.
2. Load Securing devices.
3. First Aid Kit (if driver qualified).
4. Vehicle License and Way Bills.
5. Tools properly secured.
6. Spare tire.

Source: Ontario Trucking Association Submission, Safe Trucking Is Good Business, 1982

on-road breakdowns, thus saving companies both tangible manpower dollars and intangible customer goodwill. These checks also reduce the number of accidents which is ultimately reflected in reduced insurance premiums. The O.P.A. feels that, if a carrier does not conform to a specific maintenance program, operating authority should be suspended, after appropriate warnings.

4.3.4. The largest number of defects found during roadside inspection of trucks and in trucks involved in accidents relate to the braking system (see Sec. 4.2.2.). Most trucks, including the largest and heaviest, are equipped with air-brake syste however, a large number of trucks have hydraulic brakes. Hydraulic brake systems should be checked for proper fluid level in the master cylinder, as excessive fluid depletion leads to partial or complete brake failure. Fluid leakage should also be checked along with wheel cylinder leaks, brake hoses and brake linings. Drums and discs should be checked for minimum metal limits.

Air brake systems are more complex than hydraulic systems, with valves prone to moisture problems. Air brake systems need clean dry air, correct air pressure, proper valves and plumbing, no leaks in the system, proper drums and linings, serviceable tires and a short and equal brake stroke. Excessive push rod travel reduces the effective pressure of the brake lining on the brake drum surface, thus increasing lag time and stopping distance. Based on the M.T.C. heavy truck inspections, it is estimated that about 40% of air-braked vehicles have excessive push rod travel, and that 60% of vehicles having air brake defects have at least one brake chamber out of adjustment. While brake adjustment is a relatively simple maintenance procedure, this task is being neglected, and brakes out of adjustment account for the highest percentage of trucks being placed out of service during the M.T.C. roadside inspections. Certain vehicle and axle configurations make inspection of brake adjustment difficult. For example, dual drive axles and low-bed trailers are more difficult to inspect due to lack of space, but these difficulties should not be an excuse for failure to check brake adjustment on a regular basis. Manufacturers should be encouraged to develop brake chambers with marked push rods which would allow one man to measure push rod travel quickly and easily. The development of reliable automati slack adjusters capable of maintaining proper stroke level without constant manua readjustment would be of great benefit, probably reducing brake defects tremendously.

4.3.5. In addition to the brake and tire and wheel systems, attention must also be given to other components, to ensure the complete safety of a vehicle. The steering and suspension system should be inspected regularly. Steering wheel slack should not be allowed to become excessive. Slack is easily measured and can usually be remedied by minor steering box adjustments. This process is quite simple but is widely neglected at present. The mechanical integrity of the

steering linkage should also be checked. Power steering systems should be examined for fluid leaks, fluid contamination and fluid level. Front-end wheel alignment should be checked to make sure that excessive discrepancies have not developed because this can lead to steering control problems and abnormal tire wear and damage.

The primary attachments of articulated vehicles should also be maintained properly. Both the upper and lower sections of a fifth wheel assembly should be checked for security and structural integrity. Attaching hardware such as bolts should be of sufficient quality to withstand the forces exerted on the assembly. Lubrication should be performed according to proper schedules. Glass, mirrors, wipers, door/hood latches, etc. are all minor problems in themselves but their condition could make the difference in an emergency situation. Structural deterioration and corrosion are cumulative processes which ultimately result in unsafe conditions. The integrity of the tractor cab is of special concern, with a prime objective being to ensure that the driver will not be exposed to carbon monoxide infiltration from the exhaust.

4.4. Vehicle Inspection

4.4.1. Ontario established the Commercial Vehicle Inspection (C.V.I.) program as a result of a 1972-73 survey which found widespread defects in commercial vehicles. At that time, the inspection personnel complement was increased to 55 in order to accommodate inspection of up to 60,000 commercial vehicles annually

Inspection activities at present consist of the following:

(a) Motor vehicles must be inspected by a licensed mechanic at a motor vehicle inspection station upon initial registration of the vehicle in Ontario, and upon change of ownership.

(b) Random/selective inspection of vehicles at roadside check points or at permanent government safety lanes, initiated by police officers.

(c) Mandatory bi-annual inspection of dump trucks and school buses.

Random inspection of all types of motor vehicles is authorized in Ontario by Section 65 of the H.T.A.:

> "Every constable and every officer appointed for the purpose of carrying out provisions of this Act may require the driver or owner of any motor vehicle or motor-assisted bicycle to submit such motor vehicle or motor-assisted bicycle, together with its equipment and any trailer attached thereto, to such examinations and tests as the constable or officer may consider expedient"

Furthermore, Section 65 gives the inspecting officer the authority to require that an unfit vehicle be made safe or removed from service, and the inspecting officer has the right to seize the vehicle or trailer licence plates and hold them until the equipment is made safe.

The C.V.I. program is a selective process. Inspections are conducted either at roadside locations, or at an operator's terminal, but approximetely three quarters of all inspections are conducted at roadside locations. The inspector's decision to inspect a vehicle may depend upon:

(a) obvious poor general appearance,

(b) obvious single serious defect

(c) operator's poor reputation,

(d) vehicle load (e.g. dangerous goods such as gasoline)

Thus the selection process is fundamentally biased. This is unavoidable, given that available resources are limited and it is impossible to inspect all commercial vehicles. All members of the M.T.C. Vehicle Inspection Section are certified Class A auto mechanics.

Of the total vehicles inspected under the C.V.I. program, the vast majority (80%) are heavy truck units, with most being equipped with air-brakes.

A Commercial Vehicle Inspection Report is prepared which contains information pertaining to vehicle type, configuration and ownership, along with a comprehensive listing of component defects which is valuable for statistical purposes. The last section of the report summarizes the type of action taken by the inspector. If major defects are found, the operator may be charged under the H.T.A. and the vehicle is prohibited from further road travel. In cases where detainment may be undesirable (e.g. perishable loads) and the defect is not deemed to be a major safety hazard, the inspector may just issue a Report Notice which specifies a time and location where the vehicle must be submitted for reinspection with the defects corrected. In the meantime, the truck is allowed back on the roadway to complete its trip. The Report Notices have been issued mostly in the Metropolitan Toronto area and, if the operator is located far from an M.T.C. inspection garage (auch as the permanent safety lanes at Keele St. and Highway 401), the inspector may allow invoices of shop work order to be submitted within a specified period in lieu of reinspection. In the case of terminal inspections, a red "UNFIT VEHICLE" tag is hung on any defective unit and although the red tag has no legal status, operators generally comply and submit documented proof of repairs to M.T.C. Of the 34,400 roadside inspections performed in 1980-81, 23% resulted in vehicles being removed from service, 3% charged under the H.T.A. and 3% issued Report Notices for further inspection. Of the 12,000 units inspected at terminals during 1980-81, 12% were assigned Unfit Vehicle tags.

The following observations can be drawn from the M.T.C. commercial vehicle inspection activities of the past four years:

(a) Refuse, logging, dump trucks and concerte mixers have been the worst offenders.

(b) In the category of multiple combinations, A-trains of all types are above the average but liquid tanker B-trains are below the average.

(c) Trailers have approximately 50% more failures than tractors.

Ontario at present has a mandatory inspection for dump trucks only and these inspections are performed by certified Class A mechanics at authorized public vehicle inspection stations located throughout the province, at the expense of the operator. The mechanic affixes a sticker to the vehicle's windshield upon successful completion of the inspection. However, these vehicles are also randomly inspected by M.T.C. or O.P.P. officers as part of the roadside inspection program. Based on M.T.C. data, the dump truck program has not succeeded in improving this class of vehicle very much but other sources, like the O.P.P. and the O.T.A. and Select Committee on Highway Safety believe that this program has been successful. The O.T.A. also cited some operational problems encountered, namely, a rush on available inspection facilities caused by operators

who avoid getting an inspection until the last moment.

4.4.2. Between 1972 and 1977 the Indiana Institute for Research in Public Safety investigated over 17,000 passenger car accidents and found that vehicle defects were a contributing cause in about 13%; the major cause was human failure in about 57%, and for 30% no definite cause could be established. Similarly in Ontario the M.T.C. in 1981 found the following:

TABLE V

Vehicle Condition	All trucks %	Tractor trailers %	Cars only %	All Vehicles %
No apparent defect	94	89	96	92
Mechanical defect	4	7.5	2.0	2.2
Unknown	2	3.5	2.0	5.8

These low mechanical defect rates are typical of police-reported accidents and some M.T.C. officials believe that vehicle defects are under-reported because of the limited amount of training of police officers in accident investigation. The Private Motor Truck Council of Canada reported that in a recent truck safety survey of 218 accidents, 58% were caused by truck driver error, 32% by third parties 7% by road condition and only 3% by mechanical failure.

Ontario has recently contributed to the study of heavy truck accident causation through a two-phase M.T.C. investigation of 140 commercial vehicle accidents in the Metropolitan Toronto area during the winters of 1980 and 1981. (See Wolkowicz and Billing: Commercial Vehicle Accident Survey: An On-the-Scene Study). According to the authors, mechanical failure is a significant but not the major cause of commercial vehicle accidents. Similarly, of the 474 accidents involving tractor-trailers reported by the O.P.P., 88% were attributed to driver actions, and 12% to mechanical failure, load shifts or other non-driver-related factors. Of the 474 accidents, only 7% were attributed to mechanical failure. On the other hand, of the 108 accidents involving tractor-trailers which were investigated by the M.T.C. technicians, 13 were attributed to mechanical failure. These results are consistent with other truck accident causation studies (see Fig. 2).

In summary, the many studies which have dealt with truck defects and their relation to accidents have found that: trucks have higher defect rates than cars; brake and tire defects are the two most common; but it is difficult to determine an exact value for the extent to which defects cause accidents. Because of the economic recession, the average truck age in Ontario is increasing and is currently about seven years, and as older trucks develop more defects, this trend is likely to be detrimental. The Teamsters' Union Submission to the Commission

noted that a significant number of commercial vehicles currently in service may not meet provincial safety standards, thereby putting both drivers and other road users at risk.

4.4.3. In recent years, the concept of the Reciprocal Critical Item Inspection has been gaining acceptance. The original concept was developed by the California Highway Patrol to assist in dealing with the growing number of accidents caused by trucks (see California Highway Patrol "Critical Item Truck Inspection Guide: A Supplement to Preventative Maintenance" 1979). The critical item inspection or "essential elements examination" as it is sometimes known, focuses truck inspection on the vehicle components most often identified as causing or contributing to accidents. Through a detailed study of over 3,000 truck accidents, the California Highway Patrol identified brakes, steering, tires and wheels as most important. Prior to implementation of the critical item program, California's procedure consisted of a very detailed inspection of all vehicle equipment, much like Ontario's current roadside truck inspection program. The critical item procedure allowed a reduction in inspection time per vehicle of about ten minutes. This increased operational efficiency considerably by allowing more vehicles to be inspected with less manpower. Upon introduction of the critical item program in California in 1979, truck-at-fault accidents did not increase for the first time since 1974, despite an estimated 13% increase in truck miles travelled, and California credits most of this turn-around to the critical inspection program.

The areas covered under the critical truck inspection include:

(a) Brakes: adjustment, air loss, pressure warning device, hoses and air lines, brake drums and shoes.
(b) Steering: column, tie-rod ends, idler arm, pitman arm.
(c) Tires & wheels: degradation, matching of tires and rims, tire load, tread depth, regrooved and recapped tires.
(d) Drawbars & fifth wheels: locking devices, play, mounting hardware, structural integrity, safety chains.
(e) Headlamps, tail lamps, brake lamps, turn signals.

In addition to these vehicular checks, driver's logs are examined.

The Commercial Vehicle Safety Alliance (C.V.S.A.) has adopted the Critical Item Truck Inspection developed by the California Highway Patrol, in order to achieve uniformity, compatibility and reciprocity between states and provinces. (See "Commercial Vehicle Safety Alliance" brochure, distributed by the American Automobile Association Foundation for Highway Safety 1982). Any authority having jurisdiction over heavy vehicle safety in any state/province is invited to join the C.V.S.A. by signing the C.V.S.A. Memorandum of Understanding, which is simply a working agreement to use standardized procedures. It in no way

entitles the member or inspected parties to any special consideration. In other words, a vehicle is not granted immunity from inspection procedures, such as Ontario's roadside comprehensive inspection. C.V.S.A. members use a common inspection program as set out in the Memorandum of Understanding and prominent colour-coded decals are issued for trucks which pass the inspection. The colour is changed every three months and the month of issuance is printed on it. Membership is free and by 1982 it had grown to include nine western states, plus one Canadian province, Alberta. British Columbia was reported to be on the verge of joining the C.V.S.A. in late 1982. Although the C.V.S.A. is currently strictly western based, a number of eastern jurisdictions have apparently expressed interest in joining.

The Canadian Conference of Motor Transport Administrators (C.C.M.T.A.) has also pursued the matter of reciprocity of commercial vehicle inspection among Canadian jurisdictions, due to the large amount of interprovincial trucking, and came to the conslusion that there should be a Canadian Vehicle Safety Alliance. Six provinces plus the Northwest Territories have already joined the Canadian Vehicle Safety Alliance but Ontario has not. The C.V.S.A. concept is based on the U.S. program and many of the statements and most of the standards and specifications of inspection found in the Canadian version of the Memorandum of Understanding are adopted directly from the original C.V.S.A. program.

The Hamilton Automobile Club and the O.T.A. both cited the success of California's critical item truck inspection program, and recommended that a similar type of program might form a basis for a truck inspection in Ontario. Even though not all items normally checked during an M.T.C. roadside inspection are likely to be inspected in other jurisdictions, and although the inspecting personnel may not generally be as skilled as Ontario vehicle inspectors, an out-of-province truck bearing a valid decal would have at least the major components inspected no more than three months earlier. This information would provide the Ontario inspectors with help in determining which trucks are to be selected for roadside inspection and allow more time to concentrate on those likely to be defective.

4.4.4. The debate about the effectiveness of inspections and whether or not they should be periodic or selective has spawned many contradictory studies. Some form of mandatory periodic inspection now exists in one half of the American states and most Canadian provinces. Because defects like brake failure do cause serious accidents, most agencies recommended to the Commission that periodic inspection remain mandatory, but there is less agreement about how frequent this should be. Under random or selective inspection, drivers and owners are forced to be constantly aware of the condition of their vehicles, especially if the perceived risk of being caught is high. Selective inspection is more productive if it concentrates on old vehicles or those which travel great distances between regular inspections. W.M. Crain in 1980 reported that mandatory periodic vehicle inspection had no

detectable effect on highway safety and argued that periodic inspection by government inspectors is interpreted by some to mean that the responsibility for safety rests with the government, not with the vehicle operator. Crain found that random inspections were at least as effective as periodic, and perhaps even more so.

Large carriers find it easier to comply with mandatory periodic inspection than do small carriers, because most of them have the facilities and they already have their own regular inspections. The O.P.P., the Teamsters Union, the O.P.A., P.M.T.C. of Canada and the Hamilton Automobile Club all recommended mandatory periodic inspection of all commercial vehicles at least annually. The O.T.A. proposed more frequent inspection and has developed uniform standards based on the C.V.S.A. critical item inspection system which it would like adopted. Further, the O.T.A. recommends that the M.T.C. continue its roadside inspections and terminal inspections and audit the records of trucking companies. There should be very stiff penalties for falsifying records.

Periodic programs may be conducted through government owned and operated inspection facilities, or through private stations. Use of private stations is easier and therefore common. The success of a periodic program which makes use of private inspection facilities depends on the integrity and competence of the mechanics employed. To help prevent shoddy or dishonest workmanship, private stations must be authorized and monitored by government inspectors. Proof of improper inspection would lead to a private station's inspection authority being revoked.

Under a selective inspection program, the possibility of inspection and of detection, and the possibility that a vehicle will be removed from service, encourage the operator to maintain his vehicle at a level which satisfies the requirements provided there is a real fear of being caught. The psychological effect of being subject to an inspection at any time of the year should encourage continued maintenance by vehicle owners, passenger and commercial alike. Selective inspection is flexible in that resources can be directed and redirected to specific vehicle sub-populations wherever the need arises and so permits a wider use of limited personnel. One type of selective inspection is the joint auditing program, or multi-faceted inspection team, commonly referred to as "inspection blitzes". These are concentrated enforcement efforts which bring together personnel from a variety of regulating authorities. For example, M.T.C. highway carrier inspectors, M.T.C. vehicle inspectors, O.P.P. police officers, personnel from the Ministries of the Environment, Revenue, Employment Standards and Workers Compensation Board, may combine to form one enforcement team which sets up at a strategic or randomly selected location for the multi-faceted inspection of commercial vehicles. The mere presence and exposure of these super teams serves to magnify the threat of detection in the minds of violators. Therefore, their use may be of substantial benefit in raising the perceived level of government inspection

activity among truck operators. The use of inspection blitzes may be best suited to border locations so that the involvement of representatives from neighbouring regulatory authorities should be encouraged (e.g. Interstate Commerce Commission, Quebec Provincial Police, etc.). The results should be made public.

4.5. THE COMMISSION RECOMMENDS THAT:

1. Driver instruction should include information on how the commercial motor vehicle's service and emergency brake systems operate, and the limitations of these braking systems under normal and emergency operating conditions.

2. The Federal Government should require that all the wheels of new commercial motor vehicles and trailers be equipped with brakes, and further, that the Canadian air brake standard should include actuation and release time requirements similar to those in the United States.

3. The Province of Ontario should adopt the C.S.A. truck tire retread standards, and M.T.C. should investigate whether rebuilt tires should be prohibited from the steering axle of larger and heavy trucks, similar to the school bus requirement.

4. The use of B trains should be encouraged and the proposed C.C.M.T.A./R.T.A.C. research on vehicle weights, dimensions and stability be integrated with the new U.S.A. overlength commercial vehicle study so as to avoid duplication of research effort.

5. Vigorous research should be continued by the M.T.C. and TRansport Canada into brake anti-lock and anti-jack-knife systems, because the presently available systems are not sufficiently reliable to warrant being made mandatory.

6. M.T.C. should monitor and evaluate the U.S. Federal Government proposed rear under-ride protection standard and M.T.C. should conduct an analysis of the feasibility, costs and benefits of introducing side under-ride protection standards for large trucks and tractor trailer combinations.

7. The overall commercial articulated vehicle length be increased in Ontario to allow the use of cab-behind-engine tractors, but a suitable king pin restriction or trailer combination length should be established.

8. The M.T.C., in cooperation with the Canadian Medical Association, should examine the truck drivers' complaints of excessive cab noise levels, heat and vibration, including their effects on cumulative fatigue.

9. Until the research evidence is clearer, truck drivers, like construction workers, should be exempted from the proposed 90 decibel noise limit under the Occupational Health and Safety Act, but they should not be exposed to greater than 95 decibels for a continuous period of over four hours.

10. All large trucks should be required to have clearly visible reflectorized markings on the sides and rear of their vehicles which meet the current Canadian Federal Motor Vehicle Safety Standard. Vehicles longer than 12.5 metres in overall length should be required to employ reflective markings in a sign indicating the vehicle is very long and further, that M.T.C. be charged with the

responsibility of determining the optimum colour, type, size, luminance and composition of the reflective markings.

11. The Ministry of Transportation and Communications should continue its present selective commercial vehicle safety inspections at roadside locations and at fleet terminals.

12. Truck operators should be required to follow an approved maintenance program, including driver pre-trip and post-trip inspections, and written records should be kept at the home terminal for a period of three years for possible M.T.C. audit.

13. The 1977 document entitled "Recommended Inspection Procedure and Pass/Fail criteria" should be revised jointly by the M.T.C. and the Ontario Trucking Association and then form the basis for the approved inspection programs.

14. Ontario should join both the Canadian Vehicle Safety Alliance and the U.S. Commercial Vehicle Safety Alliance in order to achieve reciprocity.

15. Ontario should require mandatory inspection of all heavy trucks at a 26 week, or at 100,000 kilometres, whichever comes first, to meet standards set by the M.T.C., at approved garages, and paid for by the owner of the vehicle.

CHAPTER V THE ENVIRONMENT

5.1. Weather Conditions.

5.1.1. The Ontario Ministry of Transportation and Communications now maintains a computerized accident data file which can provide a great deal of information about the conditions at the time of a motor vehicle accident. These include the weather, the lighting, the type of road and the objects with which a vehicle collides.

TABLE VI

NUMBER OF VEHICLES INVOLVED IN ONTARIO ACCIDENTS IN 1981 AND CONDITION OF ROAD SURFACE

Vehicle Type	Road Surface Condition									
	Dry		Wet		Snow		Ice		Sand/Gravel	
	#	%	#	%	#	%	#	%	#	%
Automobile	156,988	54	82,673	29	26,784	9	12,123	4	10,686	4
Light Truck	24,105	52	12,212	26	5,250	11	2,369	5	2,565	6
Straight Truck	3,200	55	1,492	25	622	11	251	4	307	5
Articulated Truck	3,981	56	1,703	24	676	10	403	6	295	4
Total	188,274	54	98,080	28	33,332	10	15,146	4	13,853	4

Table VI shows that passenger cars and trucks of all sizes do not differ significantly in their involvement in accidents on dry or slippery road surfaces; slightly more than one-half were on dry pavement and slightly more than one-quarter were on wet pavement. In addition, more than 65% of both passenger cars and trucks involved in fatal accidents occurred on dry roads, while 20% of vehicles of all sizes involved in fatal accidents occurred on wet roads, which agrees with data collected in the United States. However, wet or icy pavement conditions accounted for a greater incidence of single vehicle accidents than of multiple vehicle accidents. It was expected that trucks would be much more involved in accidents under adverse road conditions than cars, due in part to the fact that trucks must operate regardless of weather conditions in order to meet schedules, but the Ontario data showed otherwise. As noted in the 1982 M.T.C. On-the-Scene Study, truck loss of control, skidding, jack-knifing and trailer-swing are much more likely on wet or icy surfaces. The M.T.C. found that 81% of the loss of control accidents were on slippery surfaces and, of the 30 commercial vehicle jack-knifes investigated by M.T.C., only one occurred on a dry road.

5.1.2. The Commission received many letters of concern from motorists regarding

the perceived danger of following, passing or being passed by large trucks in adverse weather conditions. Many motorists complained about the "whiteout" created by large trucks on snow-covered roads, and find the blinding spray of water, slush or snow both annoying and dangerous. Truck speeds in adverse weather conditions were cited by several motorists as excessive and they felt that trucks should slow down appreciably during poor weather conditions. Truck drivers have cited the fact that, high up in their cab, they have a much better view and that they have much better traction during adverse weather conditions than cars, as the reasons for not needing to slow down as much as motorists, and many truck drivers believe their level of skill and experience justifies their higher speed during poor weather. The second most frequent weather-related concern was the wind vacuum and blast experienced when passing or being passed by large trucks at highway speeds and it was believed by a number of motorists that the situation will get worse as the population of smaller cars increases. The effects of naturally occurring winds are perceived to increase the dangers and the wind effect increases as the truck's speed increases. Many motorists have complained about difficulty in maintaining their lane during such experiences. The third concern was with dust and gravel created by large trucks which often occurs when the truck's wheels wander off the pavement onto the shoulders of the road. Many motorists have had to replace windshields damaged by flying pebbles, and expressed alarm at the hazards involved during loss of good vision.

While these concerns may very well be annoying and frustrating, the Commission was unable to find any statistical evidence of a direct relationship between these effects and motor vehicle accidents. Often motorists report that they anticipate and compensate for the wind and this may account for the absence of evidence. It is also possible that this anticipation increases the perceived severity of the event. In some instances, motorists may be able to avoid the splash or vacuum effect by remaining at an appropriate distance behind the truck, but this is sometimes not possible, for example, when a long truck does the overtaking.

5.1.3. The Ontario H.T.A. requires that every motor vehicle and every trailer be equipped with mudguards or fenders or some other device which will suppress splash and spray unless adequate protection is provided by the body of the vehicle or trailer. Surprisingly, there are no Canadian safety standards requiring suitable mudflaps on new vehicles. Most splash and spray is created from water or wet snow picked up by tires and thrown outward and backward. As the larger droplets strike the road, or truck, or the following tires, they are shattered into fine droplets and are caught up into the air stream. Cross winds may complicate the flow and make it difficult to design mudflaps and skirts to suppress the spray. A motorist's forward vision and truck driver's rearward vision can be reduced to zero for dangerously long periods of time. Blindness occurs most

frequently during overtaking and lane changing because much of the spray is thrown out sidewise.

Unfortunately some improvements to road surface for better traction and shorter stopping distances have increased splash and spray by retaining water on the pavement surface for longer periods of time. The amount of splash and spray is closely related to speed, and tests carried out by the Western Highway Institute since 1967 have shown that it is not significant until speeds of over 30 miles per hour are reached. At speeds over 50 miles per hour, it increases rapidly, so one of the best ways to reduce splash and spray is to slow down! Many other factors are involved such as size, weight, configuration, tires, and the location of fuel tanks. Research on the design of trucks has been concerned primarily with aerodynamic drag, so as to achieve fuel efficiency, rather than on spray suppression.

While conventional mudflaps reduce splashes of water, mud and gravel, they unfortunately may increase the amount of spray, because water thrown against their hard surfaces is broken into very fine droplets and carried outward by wind currents. A great deal of research has been conducted toward improving mudflaps by using rough surfaces similar to artificial grass, which reduce the rebounding of water droplets by channelling the water downwards to the road surface. Attempts have been made to replace conventional fenders by fenders with water collectors. A perforated sheet is placed between the tire and the solid fender so that water passing through the perforations is deflected by the solid fender into a drainage system.

Much spray is thrown off at the top of a tire and by the bottom of a trailer, which may be blasted sidewise directly into the path of a motorist at the level of the windshield during overtaking. Truck skirts and side flaps may be effective in suppressing this and recent tests on small skirts made of "no rebound" materials like artificial grass have shown promise. Attempts have been made to use air deflectors without much success. Many of the warm weather mudflaps in use in the U.S.A. may be unsuitable for use in Canadian winters, so the special problems caused by snow, slush and ice are being investigated by Transport Canada and various manufacturers. M.T.C. has tested anti-splash and spray devices and has found them to be 70% effective but it is not known whether there will be real benefits because the correlation between splash and spray and truck accidents has not been clearly demonstrated. The recent U.S. Surface Transportation Act 1982 sets out a time-table for the mandatory equipping of trucks, tractors and trailers on the interstate system with splash and spray suppression devices within two years.

5.2. Road Conditions

5.2.1. Accident rates for all types of vehicles are consistently higher in urban areas than rural areas. In 1981, 74% of the passenger cars and 62% of the trucks involved in accidents in Ontario occurred on urban roads. This is to be expected because of the higher average daily traffic in urban areas. However, both passenger cars and trucks are more likely to be involved in fatal motor vehicle accidents in rural areas than urban areas. In 1981, 65% of the cars and 75% of the trucks involved in fatal motor vehicle accidents occurred in rural areas. This is probably due to higher speeds.

TABLE VII

NUMBER OF VEHICLES INVOLVED IN ONTARIO ACCIDENTS IN 1981 AND TYPE OF ROAD

Vehicle Type	Road Type: Provincial Highway		Other Road		Private Property	
	#	%	#	%	#	%
Automobile	43,884	15	234,039	81	11,331	4
Light Truck	7,750	17	36,012	77	2,739	6
Straight Truck	1,343	23	4,225	72	304	5
Articulated Truck	3,663	52	3,057	43	338	5
Total	56,640	16	277,333	80	14,712	4

The above data show that the majority of automobiles, light trucks and straight trucks involved in accidents are on non-provincial highways. Only articulated trucks appear more likely to be involved in a motor vehicle accident on provincial highways and this is probably due to the greater time spent by these vehicles on provincial highways than on rural or municipal roads. Generally, highways have lower accident rates than non-highways when expressed in accidents per mile or per vehicle. This may be due to the benefits of fully controlled access, segregation of traffic moving in opposite directions, and passing lanes.

5.2.2. In 1978 the O.P.P. expressed concern over the number of transports regularly congregating on the shoulders of the 401 Highway at several locations, especially during the hours of darkness, because several very serious collisions resulted. Many of these collisions were the result of passenger vehicles striking trucks which were either parked on the highway shoulder or pulling out from or onto the shoulder, and a review of the accident data from M.T.C. indicates that over 2,800 motor vehicle collisions involved parked vehicles, of which 25% were parked for non-emergency purposes. These accidents resulted in 20 fatalities. Under the legislation at that time, there was no provision for the

O.P.P. to issue parking tickets, so in 1982 the Minister introduced revisions to the H.T.A. which prohibited parking along shoulders of certain highways except in an emergency. In addition, the Ministry has initiated a construction program to provide off-highway rest areas for motorists and truck drivers, and the prohibition of parking on freeway shoulders will be expanded as the rest area program is completed. However, some truck drivers and motorists believe that the new prohibition against parking on the shoulder in non-emergencies may contribute to driver fatigue. If rest areas are provided at appropriate intervals, this potential negative consequence should be reduced.

It was also found that transport trucks pulling off the highway to the shoulder of the road contributed to the deterioration of the shoulders, thus creating a hazard for others. In addition, it created a costly and time-consuming maintenance problem. The M.T.C. Paved Shoulder Program is designed to reduce the frequency of shoulder-related accidents and reduce the need for maintenance. A partially paved shoulder is one with a hard surface, usually asphalt, but for a width of only 0.5 metre closest to the adjacent travel lane and the remaining shoulder surface is gravel. Fully paved shoulders are provided on freeways having three or more lanes in one direction; in urban areas where the sidewalk is located 3 metres or less from the through lanes; in urban areas where there is a high density of commercial entrances and as a protection against shoulder erosion on steep grades. M.T.C. is at present examining a number of other uses for paved shoulders. They could be used to decrease the traffic congestion during peak periods by allowing passing on these shoulders in known bottlenecks.

The U.S. B.M.C.S. conducted a study of 2,000 accidents involving trucks between 1967 and 1975, and sixty of them involved a vehicle stopped on the shoulder of a highway. Of these, 43% involved trucks and 90% were rear-end collisions. It was found the 62% of the on-shoulder accidents occurred during darkness, and drivers dozing at the wheel were suspected to be the primary cause in 53% of the accidents. The Ontario Forest Industries Association and the Motor Vehicle Safety Association, in their briefs to the Commission, recommended that rest areas of suitable design to accommodate truck traffic be constructed on multi-lane roads, expressways or two-lane highways. Rest areas at regular intervals would allow vehicles to pull well off the travelled portion of the highways, to enable drivers to perform vehicle inspections, check load security, or take a rest break.

5.2.3.

TABLE VIII

NUMBER OF VEHICLES INVOLVED IN ONTARIO ACCIDENTS IN 1981

AND ROAD ALIGNMENT

Vehicle Type	Road Alignment: Straight Road on Level Surface		Straight Road on Hill		Curve on Level Surface		Curve on Hill	
	#	%	#	%	#	%	#	%
Automobile	216,924	78	36,251	13	17,305	6	8,970	3
Light Truck	33,468	76	5,861	13	3,112	7	1,793	4
Straight Truck	4,159	74	864	15	365	7	229	4
Articulated Truck	4,530	67	1,190	17	593	9	479	7
Total	259,081	77	44,166	13	21,375	6	11,471	4

The above data show that the majority of cars and trucks were involved in accidents on straight roads on level surfaces as were the majority of fatal accidents. The interpretation of this information is difficult because the travel exposure to curves on hilly portions of the roadway are unknown, in Canada or in the U.S.A.

A U.S. N.H.T.S.A. report by Bondy and Pastyke (1980) found that more single vehicle truck accidents occurred on curved sections of the roadway than multiple-vehicle accidents. A report by Wright and Zador entitled: Study of Fatal Rollover Crashes in Georgia found that road curvature was a very significant factor, and rollovers were most likely to leave the roadway on left-hand curves and from the outside lane of the road. Slightly more rollover crashes occur on downhill slopes than on uphill slopes.

5.2.4. Many motorists have expressed concern to the Commission about the slowness of some heavy trucks climbing highway grades, and the excessive speeds of these same trucks travelling down a grade. Many motorists resent the delay caused by following a slower-moving vehicle up a grade and it is likely that the frustration may encourage unsafe passing manoeuvers. On the other hand, many motorists feel intimidated when a larger and heavier vehicle overtakes at a great rate of speed, and have complained of being tailgaited or passed by trucks on downgrades, only to be slowed by the same vehicle at the next upgrade. Several truck drivers have explained to the Commission that they need high speed to be able to climb without holding up following vehicles (see also section 4.2.10). Many truck drivers are reluctant to apply their brakes hard on downgrades and prefer to steer around any obstacle if possible.

Vallette et al, in a report for the U.S. F.H.A. in 1981 entitled: The Effect of Truck Size and Weight on Accident Experience and Traffic Operations noted that single vehicle truck accidents are more likely to occur on downgrades

than on upgrades, and it gets worse as the slope increases. O'Day, Filkins and Kaplan in a report entitled: Combination Vehicles: Five-year Accident Experience in 1980 found that 31% of the fatal accidents involving combination trucks occurred on grades. The frequency of runaway truck accidents in Ontario is not known but these types of accidents are often quite severe and dramatic. Eck in a 1980 report entitled: Development of Warrants for the Use and Location of Truck Escape Ramps analyzed 600 truck accidents in the U.S.A. Not surprisingly, he found that runaway truck accident rates increased with the steepness of the grade. To decrease the frequency and severity of brake failure runaway accidents on steep or long descending grades, many jurisdictions have installed truck escape ramps. These escape ramps are usually located on the downgrade and contain sand or some type of energy attenuating device to assist the driver in slowing the vehicle. There are no data on the effectiveness of these ramps other than that where they have been installed, they are often used. Some drivers have unsuccessfully attempted to ride out a runaway rather than use an available escape ramp, by using the shoulder of the road.

Warning signs are used in Canada and the United States to advise unfamiliar drivers about an approaching grade. These signs vary from a simple warning about a "steep grade" to information about the nature of the grade (length, curvature and gradient) and the recommended speed. Research results by Meyers et al in 1980 are contained in a report to the U.S. F.H.A. entitled: Feasibility of a Grade Severity Rating System. This research showed that a rating system based on grade length and steepness is feasible and signs were developed to advise truck drivers of the safe descent speed based on the gross vehicle weight of the truck. The U.S. Federal Government has tested several rating systems and plans to use those which have proven to be effective in the near future. A report by Abrahamsohn et al of M.T.C. entitled: The Highway 401 Freeway Corridor Traffic Management Study, 1982 noted that "the combination of 10% trucks with the existing grades on the Bypass results in capacity reductions of up to 27% on some roadway sections. On level sections the capacity reduction due to trucks is only 9%."

The Council on Uniform Traffic Control Devices for Canada has recently approved a revised steep hill sign. The old sign depicts a silhouette of a passenger car descending a grade. The new sign depicts a heavy truck rather than a car, and accompanying advisory tabs are included, advising the use of lower gears. The steep hill sign was revised because grade problems experienced by drivers of heavy vehicles are seldom a problem for car drivers. The Council felt that substituting the silhouette of a heavy truck would make Canadian steep hill signs more consistent with those used in other countries. Other future initiatives may include electronically actuated message signs to warn the approaching truck that, based on his weight and speed, he is travelling too fast for the downgrade.

The Ontario M.T.C. has a truck climbing and passing lane program. It has been shown that truck-climbing lanes increase roadway capacity, improve travel times and reduce accident rates. The width of the truck-climbing lane is usually 0.25 metres less than the adjacent through lane, but in no case less than 3.25 metres wide. Passing lanes are very similar to climbing lanes but are not necessarily located on upgrades, and are valuable on two-lane roads carrying a large number of slow moving vehicles.

5.2.5. The M.T.C. accident data file provides the following information about the first object struck at the time of the motor vehicle accident:

TABLE IX

NUMBER OF VEHICLES INVOLVED IN ONTARIO ACCIDENTS IN 1981
AND OBJECT FIRST STRUCK IN THE ACCIDENT

Object Struck	Vehicle Type: Automobile #	%	Light Truck #	%	Straight Truck #	%	Articulated Truck #	%
Other Motor Vehicle	242,088	84	37,596	81	4,722	81	4,975	71
Other Moveable Object	9,899	3	1,740	4	154	3	229	3
Fixed Object	32,325	11	5,815	13	676	12	1,232	18
Fire/Explosive	420	0.2	117	0.3	35	0.6	48	0.7
Rollover	1,713	0.6	565	1	127	2	198	3
Other Non-Collision	1,855	0.6	453	1	98	2	315	5
Total	288,300	100	46,286	100	5,812	100	6,997	100

The above data show that the majority of accident-involved vehicles struck another motor vehicle first, rather than another object. Similarly the majority of both passenger cars and trucks involved in fatal motor vehicle accidents struck another motor vehicle initially. It was found that 60% of the passenger cars, light and straight trucks involved in fatal accidents struck another motor vehicle and 83% of the articulated trucks. The data showed that fixed objects represent a greater threat for passenger cars than for trucks, but the frequency of fire, explosion and rollovers was small.

The Government of Ontario, like most North American jurisdictions, has expended considerable effort into the development of more "forgiving" roadside features and protective devices to reduce the frequency and severity of accidents, and most of this research has concentrated on the higher speed expressways. The effort has focussed on passenger-car safety features and, until the mid-1970's, the development of traffic barriers for heavier types of vehicles was considered unfeasible.

The M.T.C. has an ongoing Roadside Hazard Removal Program, which includes: trees, guide-rails, utility poles, curbs, culverts, abutments, boulders and fence posts. All trees within 30 feet of the edge of pavement on highways with speed limits of 100 k.p.h. are considered roadside hazards. The M.T.C. policy on lighting and utility poles is that these poles should be placed outside the clear roadside recovery area which is not always possible, so the poles should have a suitable buffer. Traffic barriers may be used byt they may be a potential hazard in themselves and therefore the number of installations is kept to a minimum. There are three types of traffic barriers:

(a) flexible, 3 cable guide rail,

(b) semi-rigid, steel beam guide rail,

(c) rigid, curved concrete blocks.

The major difference between these three types is the amount of deflection that takes place when the barrier is struck. Recently, concrete safety barriers, commonly referred to as the Jersey barrier, have been designed and shaped so as to deflect a truck back into its lane. Research has shown that these barriers are very effective in preventing large and heavy vehicles from breaking through into opposing lanes of traffic, but at over 55 miles per hour at 15 degrees, the tractor and front of a trailer may climb the barrier. Generally these types of barriers are quite expensive and are used only on the median of high speed, high truck volume routes.

Crash cushions are seen quite frequently on our highways. They are normally sand-filled barrels that act to prevent out-of-control vehicles from striking rigid roadside hazards by rapidly slowing down the vehicle or by redirecting an errant vehicle back into the roadway. The most common applications are at ramps on freeways, and bridge piers, overhead sign supports and abutments. There is real doubt about the effectiveness of crash cushions in heavy truck accidents and many truckers believe that these cushions would not be enough to prevent serious or fatal injury.

5.2.6. The capacity of a highway is affected by lane width,and travelling beside a truck on a narrow lane road is more threatening to a motorist than travelling beside one on a wide lane road. Commonly two-lane rural roads or secondary low volume highways are only three metres wide, some secondary highways are 3.25 metres wide, intermediate highways are usually 3.50 metres wide and most freeways and major highways are 3.75 metres wide. Wider lanes reduce the frequency of traffic accidents, improve the operational characteristics of the roadway and reduce traffic congestion.

Studies by Wright et al entitled: Effect of Pavement Markers on Nighttime Crashes in Georgie and Survivability of Reflectorized Pavement Markings, for the U.S. Insurance Institute for Highway Safety have reported that reflec-

torized pavement markers on the centre lines of sharp curves reduce night-time crashes by 22%. Other research into road markings by Nedas et al in 1981 entitled: Road Marking as an Alcohol Countermeasure in Traffic Safety: A Field Test of Standard and Wide Edge-line, reported that driving performance improved when edge-lines were added to the sides of the highway. The tests found that four-inch edgelines are good, six-inch are better and eight-inch are better still because wide edgelines make the road more visible and help drivers maintain their vehicle properly in the lane. Wider edgelines benefit drivers who are fatigues or have poor eyesight because of medical condition, age or alcohol impairment.

TABLE X

NUMBER OF VEHICLES INVOLVED IN MOTOR VEHICLE ACCIDENTS IN 1981 ON RAMPS

	All Ramp Accidents		Fatal Ramp Accidents	
Vehicle Type	Number of Vehicles	% of All Accident Involved Vehicles	Number of Vehicles	% of All Fatal Accid Involved Vehicles
Automobile	2,620	.9	4	.3
Light Truck	329	.7	2	.6
Straight Truck	73	1.3	-	0
Articulated Truck	169	3	1	.7
Total	3,191		7	

The M.T.C. data indicate that ramp accidents are rare for passenger cars and trucks but when they do occur, a higher proportion of articulated trucks is involved. It has been suggested to the Commission that the instability of tractor-trailers when travelling on expressway ramps is at least partially determined by the radius of the curve and speed of the vehicle. It is felt by some that critical values of curve radius and speed are very close to the normal operating conditions of many trucks and that the truck drivers are often not aware of the narrow margin of safety. M.T.C.'s geometric design standards for freeway ramps are intended to provide for a smooth trajectory for vehicles, and ramp advisory speeds are posted. Generally, trucks will roll over at speeds much lower than those required by passenger cars, and a rollover in a steady curve on a ramp can be expected if a truck exceeds the advisory speed by more than 30%.

Vallette et al in a 1981 report entitled: The Effect of Truck Size and Weight on Accident Experience and Traffic Operations, prepared for the U.S. F.H.A. found that more ramp accidents occurred in urban areas than rural locations. This is not surprising given the urban truck traffic volume and frequency of ramps and the higher off-ramp truck accident frequency probably reflects

faster exit speed. U.S. B.M.C.S. data for 1979 show that more collisions occurred at on-ramps and more single vehicle accidents occurred at off-ramps.

The Commission has concluded that the M.T.C. signs are adequate for safety against rollover if the posted advisory speeds are observed and if drivers are more cautious and slow down in wet or slippery conditions.

5.2.7. The Ontario Ministry of Transportation and Communications accident data file provides the following information about the number of vehicles involved in accidents at intersections:

TABLE XI
NUMBER OF VEHICLES INVOLVED IN ONTARIO ACCIDENTS
IN 1981 IN INTERSECTIONS

Vehicle Type	Intersection Accidents		Fatal Intersection Accidents	
	# of Vehicles	% of ALL Road Locations	# of Vehicles	% of ALL Road Locations
Automobile	129,370	45	294	23
Light Truck	18,481	40	93	29
Straight Truck	2,255	39	19	35
Articulated Truck	2,069	29	36	24
Total	152,175	44	442	25

Table XI shows that 45% of all automobile accidents occur at intersections and 23% are fatal. The numbers for heavy trucks are much fewer but the fatality rate is about the same. This is probably due to the fact that heavy trucks spend more time on highways where there are fewer intersections. Similar results have been obtained in the U.S.A. by O'Day in 1980 and by Vallette et al in 1981.

5.3. Traffic Conditions

5.3.1. At present, truck traffic information can be obtained from a few M.T.C. permanent counting stations for five minute, one hour, twenty-four hour and forty-eight hour periods. Statistics Canada and Canadian Customs provide classification information at border and ferry crossings, and a limited amount of traffic information is provided by the M.T.C. weigh stations throughout the province.

At present, the M.T.C. undertakes both automated and manual vehicle counts. Automated counting is performed at the permanent stations and during inventory at sideroads. Automatic counting uses inductive loops or "road-hoses" located in or across the traffic lanes. Vehicle type is obtained by visual observation and this is usually done for only short periods of time and on special request, because technician fatigue or inattentiveness can introduce errors. The M.T.C. is evaluating a Permanent Counting Station Telemetry System which will provide microprocessors at the station so that data can be relayed by telephone lines to a central computer.

The M.T.C. has estimated that there were almost 71,000 million vehicle kilometers travelled on provincial roads in 1981 and 46% of these were on highways. The motor vehicle accident rate per million kilometers travelled is: 0.8 on expressways; 1.2 on main highways and 1.6 on secondary highways. Non-highway roads experienced a rate of 4.3.

5.3.2. Data collected at the weigh-in-motion scale near Whitby on Highway 401 during a one week period in October 1982 indicated that car to truck ratio averaged 1.4 : 1 on weekdays; 8 : 1 on Saturday and 17 : 1 on Sunday. Single unit two and three axle trucks comprised 26% of the truck traffic during the week but rose to 39% on Saturday and 56% on Sunday.

Between 1977 and 1979 the M.T.C. conducted travel surveys at four locations on the Highway 401, Metro-Toronto Bypass. The Bypass has become one of the busiest highways in North America, having increased from 55,000 vehicles per day in 1958 to an average of 233,800 between Dufferin and Keele Streets in 1980. Since 1966 the traffic volume has increased at an annual rate averaging 10% but the most rapid growth occurred before 1971. The average daily traffic during the winter months is about 10% below the annual average. Generally, the traffic volume increases slowly from Monday to Friday and decreases dramatically on the weekend. (See also Table XII and section 6.4.3.) In 1977, traffic congestion alone was responsible for slowing the average speed by 7 km./hr. and 23 km./hr. during the morning and afternoon rush hour peaks. Between 1975 and 1979 truck traffic decreased gradually as a percentage of the total traffic; however the proportion of heavy trucks increased at all six stations. (See Highway

401 in Metropolitan Toronto by R.C. Lau, M.T.C., May 1982).

A similar situation exists in the vicinity of Hamilton. The Regional Municipality of Hamilton-Wentworth made a traffic count in 1981 and found that between 6.30 a.m. and 11.30 p.m., 11% of the total traffic was due to trucks, but it dropped to 6% during the morning and evening rush hours when many motorists are commuting.

5.4. Time of Occurrence

5.4.1. The Ontario Ministry of Transportation and Communications' computer accident data file provides the following information about the number of vehicles involved in accidents by day of week:

TABLE XII

NUMBER OF VEHICLES INVOLVED IN ONTARIO ACCIDENTS IN 1981 BY DAY OF WEEK

Day of Week	Type of Vehicle							
	Automobile		Light Truck		Straight Truck		Articulated Truck	
	No.	%	No.	%	No.	%	No.	%
Monday	36,946	13	6,350	14	1,026	18	1,184	17
Tuesday	39,035	14	6,590	14	1,095	19	1,313	19
Wednesday	37,064	13	6,353	14	941	16	1,207	17
Thursday	43,893	15	7,299	16	1,070	18	1,256	18
Friday	53,218	18	8,641	18	1,118	19	1,304	19
Saturday	47,014	16	7,011	15	427	7	544	7
Sunday	31,623	11	4,160	9	173	3	229	3
Total	288,793	100	46,404	100	5,850	100	7,037	100

The above data indicate that, while the proportion of passenger cars and light trucks in accidents increases slightly during the week, the proportion of straight and articulated trucks remains relatively the same. Sunday was the day of fewest accidents while Friday was the worst. In addition, accidents occurring during Friday, Saturday and Sunday were more severe and 60% of fatal accidents occurred on weekends. (See also Section 6.4.6 for Sunday trucking regulation)

TABLE XIII

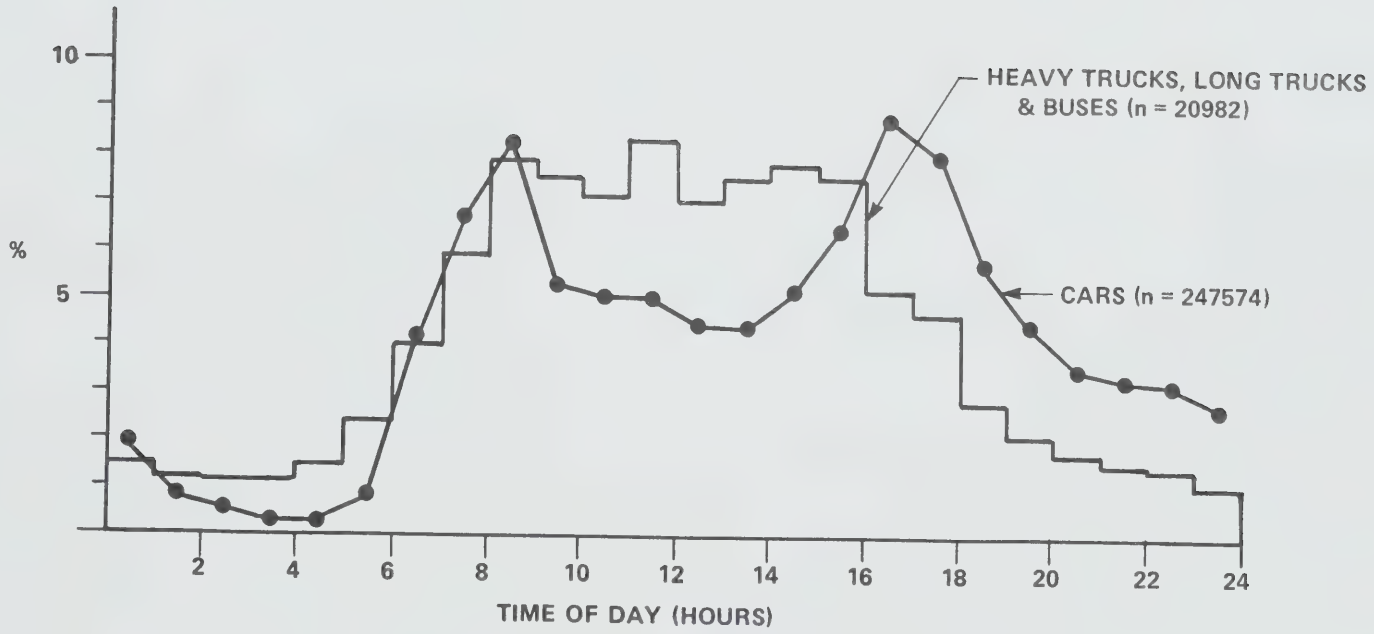
NUMBER OF VEHICLES INVOLVED IN ONTARIO ACCIDENTS IN 1981 AND LIGHT CONDITION

Vehicle Type	Light Condition					
	Daylight		Darkness		Dusk/Dawn	
	No.	%	No.	%	No.	%
Automobile	184,429	64	90,957	31	13,868	5
Light Truck	31,565	68	12,904	28	2,032	4
Straight Truck	4,945	84	756	13	171	3
Articulated Truck	4,968	70	1,831	26	259	4
Total	225,907	65	106,448	31	16,330	4

5.4.2. Table XIII shows that most of the accidents occurred during daylight. Trucks, particularly straight trucks, were slightly more likely to be involved in accidents during the daylight than passenger cars. Interpretation of these data regarding the over- or under-involvement of trucks in accidents is difficult and the accident frequencies may only indicate that there are more trucks travelling in the daylight hours. In addition, while both automobiles and light trucks experienced more fatal accidents during darkness, straight and articulated trucks were more likely to be involved in fatal accidents during daylight. The U.S. B.M.C.S. 1980 data indicate that large truck accidents during darkness were more severe; 27% of all truck accidents occurred in darkness but accounted for 41% of all fatal accidents involving large trucks.

It has been suggested to the Commission that the greater frequency of trucks involved in accidents during darkness than cars could be related to driver fatigue. Drivers may be much more likely to be drowsy or inattentive during the normal nocturnal cycle and this may be particularly true for long distance drivers or those on irregular work schedules. A survey of the opinions of the participants at the 1982 U.S. National Research Council's Human Factors Workshop session on truck driver safety ranked weather and natural lighting as the second to driver error as the most frequent cause of accidents. Unfortunately the effects of a driver's work schedule on his alertness and driving performance at night is not well understood. For some drivers, it appears that night driving is preferred because of a sense of freedom and lower stress due to easier traffic conditions.

5.4.3. The Metropolitan Toronto Highway 401 Bypass study provided valuable data about the hourly distribution of cars and trucks and the On-the-Scene Study by Wokkowicz and Billing compares the traffic volume with the accident rate for C.A.V.'s. (See Fig. 11 and Fig. 14). It is clear that there are two peaks involving cars at about 8 a.m. and at 5.00 p.m. but the truck accidents rise in frequency in the morning and remain high all day until about 4.00 p.m. when the percentage declines slowly.



Hourly Distribution, Heavy Trucks, Long Trucks, Buses & Cars
at Hwy 401 & Keele St. (Hwy 401 Bypass)

FIGURE 11

Source: Ontario Ministry of Transportation and Communications,
Commercial Vehicle Accident Survey, 1982,
Report RR-235

5.5. THE COMMISSION RECOMMENDS THAT:

1. The Ontario Highway Traffic Act should be amended to include a provision for driving at reasonable and prudcnt speeds for the weather and traffic conditions prevailing, similar to those in the U.S.A. and other Canadian provinces.

2. The Ontario Ministry of Transportation and Transport Canada should support the current research on improved splash and spray suppression devices and should monitor the U.S.A. activity with respect to performance and new standards. They should be evaluated relative to the weather conditions in Ontario, with a view to ultimate adoption.

3. The M.T.C. should accelerate as much as possible its programs for rest areas; truck-climbing and passing lanes; warning signs; night-time road markers; and the use of safety barriers, crash cushions and escap ramps.

CHAPTER VI RULES OF THE ROAD

6.1. Common Offences

6.1.1. The Ontario Highway Traffic Act Sections 109 through to 158 deal with a very large number of types of traffic violations which are collectively referred to as the "rules of the road". There are sections dealing with speed, limits; careless driving; failing to obey signs; improper turns; disobeying signal lights and signs; failing to share the road; improper lane changes and passing; following too closely; improper lights and improper parking. Some of these violations are more dangerous and more frequent than others. Table XIV gives 1981 data for the five violations most frequently involved in accidents in Ontario for motorists of all kinds.

TABLE XIV

Violation	Number	%
Failure to yield right of way	37,267	22.8
Speeding	28,336	17.2
Loss of control	24,549	14.9
Following too close	17,231	10.6
Improper turns	12,723	7.7
Other	43,859	26.8
Total	163,965	100.

These numbers should be compared with 145,220 accidents where the drivers were apparently driving properly. We shall see that there is a good correlation between the prevalence of these violations and the public's perception of the causes of accidents. Other violations which contribute to accidents frequently include improper passing, improper lane changes and disobeying traffic signals.

Fig. 12 shows the Distribution of Accident Causes for Commercial Articulated Vehicles only, according to Wolkowicz & Billing in the M.T.C. Research Report: Commercial Vehicle Accident Survey: On-the-Scene Study 1982. It compares the M.T.C. data and the O.P.P. data for several causes. It is seen that the M.T.C. and O.P.P. data differ only slightly and that the ranking for truck accidents is a little different from Table XIV, in that speeding too fast for the prevailing conditions is by far the number one factor, and improper passing, lane changes and tailgaiting are higher in the ranking.

6.1.2. Over three quarters of a million drivers were convicted of speeding violations during 1981 which accounts for 60% of all convictions under the Highway Traffic Act, so it is not surprising that speeding is one of the most frequent causes of truck accidents. The O.P.P. provided the Commission with the data for the number of charges laid against truck drivers since 1979.

TABLE XV

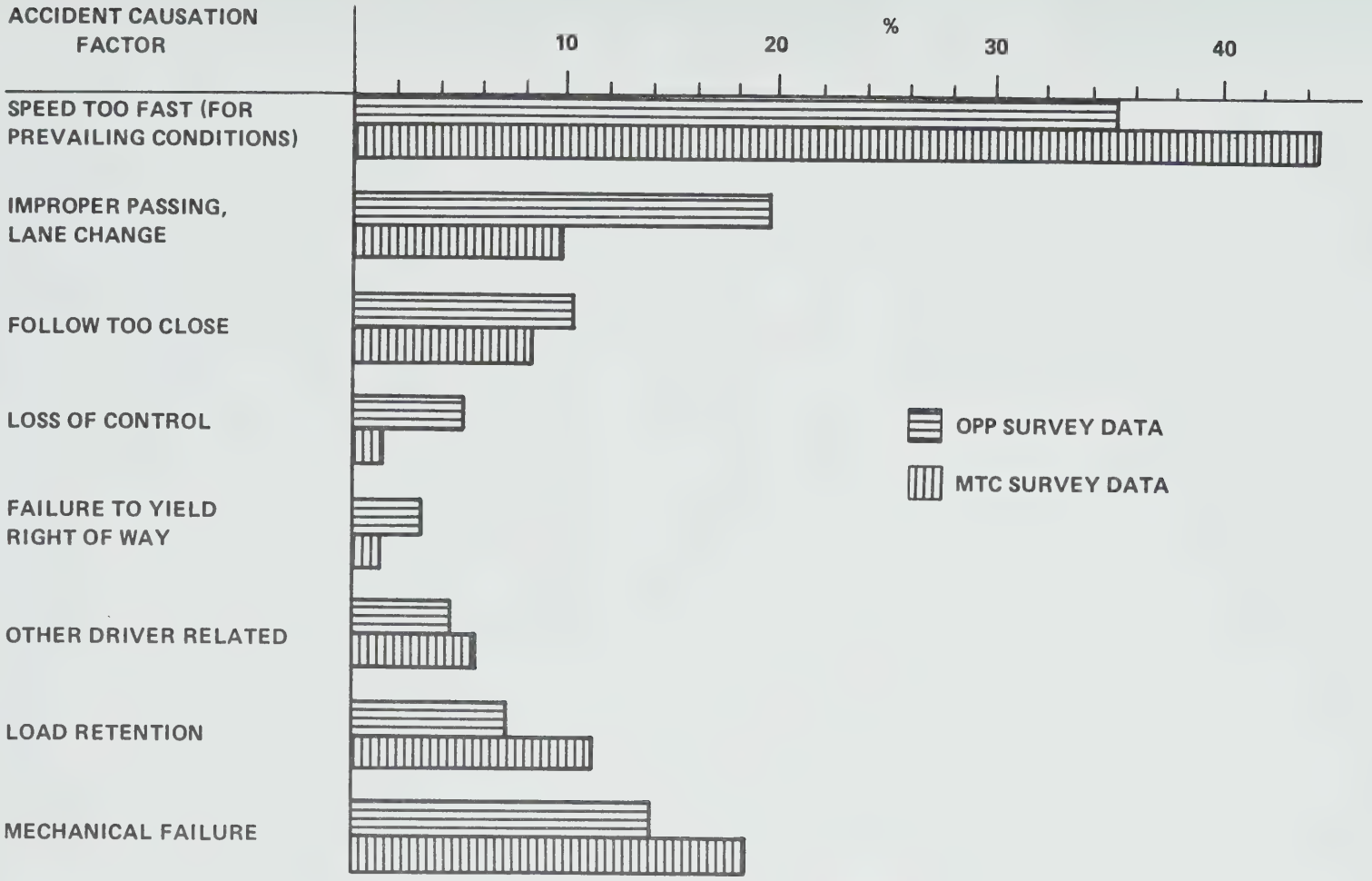
Type of truck speeding	1979	1980	1981
Straight truck (including pick-ups and vans)	30,604	30,329	32,589
Tractor semi-trailers	3,497	3,243	3,560
Straight Trucks with trailers	535	708	772
Total	34,636	34,280	36,921

We see that the numbers have been increasing. This may be due to improved radar technology as well as in an increase in the number of trucks.

Careless driving is an offence and this is defined:

"Anyone who drives a vehicle on a highway without due care and attention or without reasonable consideration for other persons using the highway, and upon conviction, is liable to a fine of between $100 and $500 or to imprisonment for up to six months or both"

Conviction of careless driving brings with it six demerit points and possible suspension of the licence for up to two years. Only failure to remain at the scene of an accident brings a higher demerit penalty. In Ontario, the O.P.P. may have to lay a charge of careless driving rather than a speeding charge because of the interpretation the courts make of the existing speed limits.



% Distribution Accident Causation Factors, CAVs Only

FIGURE 12

Source: Ontario Ministry of Transportation and Communications, Commercial Vehicle Accident Survey, 1982, Report RR-235

6.2. Speed Limits

6.2.1. Under the Ontario Highway Traffic Act, the Minister has the authority to set speed limits for types of roads, classes of vehicles or periods of the day or night. Prior to February 1976, cars were limited to 70 miles per hour and trucks to 60 miles per hour on Ontario freeways. In February 1976 the limits were lowered by 5 or 10 miles per hour, depending on the type of road; and in September 1977 all speed limits were converted to the metric units: kilometres per hour. Minor changes were made and some limits were raised slightly to round them off in the metric system. Without attempting to specify all the details and restrictions, the general limits are now the same for all vehicles:

(a) 100 km./h. for multilane expressways
(b) 90 km./h. for two-lane primary highways
(c) 80 km./h. for secondary highways
(d) 50 km./h. for built-up areas
(e) varying lesser limits for school zones, parks, bridges and construction zones.

6.2.2. Seven Canadian provinces substantially conform to a speed requirement which states that:

> "No person shall drive a vehicle at a speed greater than is reasonable and prudent under the conditions and having regard to the actual and potential hazards then existing"

Also, this wording is identical to the first statement of the U.S. Uniform Vehicle Code, SS11-801, which is the basic rule for most of the U.S.A. However, Ontario does NOT have such a requirement. Alberta goes a little further and specifies the conditions, which include: the weather, the traffic, the mechanical condition of the vehicle and the nature of the road. The actual speed limits vary widely between provinces and states and, while Ontario limits are comparable to those of the other pròvinces, Ontario does NOT have different limits for day time and night time as do five of the provinces, nor does Ontario differentiate between good and bad weather conditions. However signs are posted to warn drivers to reduce speed on wet pavements. No province prescribes different speed limits for different vehicle classes, i.e. between trucks and cars.

The U.S. Uniform Vehicle Code has a second paragraph which states:

> "Consistent with the foregoing, every person shall drive at a safe and appropriate speed when approaching and crossing an intersection or railroad grade crossing, when approaching and going around a curve, when approaching a hill crest, when travelling upon any narrow or winding roadway, and when special hazards exist with respect to pedestrians or other traffic or by reason of weather or highway conditions"

The District of Columbia and 23 states conform closely to these directives.

The maximum speed limits in the U.S.A. are generally:

(a) 30 miles per hour (50 km./h.) in urban areas

(b) 55 miles per hour (90 km./h.) on highways.

These may be altered by State and local authorities but since 1974 the limit has been 55 m./h. on all interstate highways. Thirty-six states require limits which are absolute rather than prima facie. Under prima facie rules, driving in excess of posted limits is evidence of speeding unless the driver can prove that his speed was reasonable under the circumstances. While the Uniform Vehicle Code does not specify limits based on type or use of vehicle, thirty states have at least one lower speed limit applicable to certain classes of buses, heavy trucks or articulated combinations. Twenty-five states have speed limits by type of highway and many have lower posted speed limits for congested or hazardous zones.

6.2.3. Prior to 1974 the maximum speed was 65 m.p.h. but the U.S. Emergency Highway Energy Conservation Act was passed 2 January 1974 which set the speed limit at 55 m.p.h. (90 km./h.) It was originally intended to be only a temporary measure in response to fuel shortages caused by the 1973 oil embargo but later it was made permanent. It prohibits the U.S. Secretary of Transportation from authorizing federal financial aid for highway construction projects in those states which fail to enforce the 55 m.p.h. standard. The U.S. N.H.T.S.A. report (1979) entitled the "55 m.p.h. Fact Book" explains the reasons why 55 m.p.h. was selected. While tests showed that the fuel efficient speed for most trucks is about 35 m.p.h. and for cars it ranges between 30 and 50 m.p.h., fuel consumption by all vehicles increases significantly at speeds greater than 60 m.p.h. The probability of fatalities doubles as crash speed increases from 45 to 60 m.p.h. and doubles again from 60 to 70 m.p.h. The tendency toward greater vehicle size disparity in the traffic mix adds importance to both slower speed and uniform traffic flow if the probability and severity of accidents are to be reduced. The number of drivers who can maintain proper control over their vehicle decreases rapidly at speeds over 55 m.p.h. After reviewing the need for the rapid movement of goods and people, but with a due regard to risk of death or injury, the U.S. Congress decided that 55 m.p.h. was the most practical maximum speed for to-day's conditions.

Dramatic reductions in fatalities (16% in 1974) were achieved after implementation of the 55 m.p.h. limit. The Comptroller General of the U.S.A. in a 1977 Report to the U.S. Congress regarding the effects of the 55 m.p.h. limit, noted that in the three years following its enactment, the lower speed limit had led to:

(a) decrease in average speeds,
(b) increase in the percentage of vehicles travelling at the same speed,
(c) decrease in traffic fatalities and in the fatality rate,
(d) decrease in the number and severity of accidents and injuries.

The report states that other factors, such as a decrease in distances travelled due to less availability of fuel, improved driver habits, changes in travel patterns and better law enforcement were factors which combined with the reduced speed limit to produce the dramatic decreases in fatalities and injuries observed after 1973. While the safety benefits of lower speeds are generally recognized, identification of the benefits directly attributable to the U.S.A. 55 m.p.h. limit is difficult to identify separately because the other factors came into play.

A U.S.A. study by Campbell et al (1976) conducted at the University of Michigan for the National Highway Traffic Safety Administration (N.H.T.S.A.) examined the highway safety effects of the energy crisis on selected toll roads, by vehicle type. Passenger car average speeds reduced by about 8 m.p.h., while large truck speeds reduced by only 4 m.p.h. Also, car traffic dropped by about 15% as a result of the energy crisis, while large truck traffic did not change significantly. These figures show that, if freight has to be moved by truck, it will move, and as quickly as possible. It would appear that private automobile drivers have greater scope for altering their driving behaviour in response to influences such as fuel shortages and price increases. Campbell also found that overall accident rates have declined by much more than could be attributed to decrease in travel alone. Accident severity was also reduced and speed reduction is cited as a probably significant influence. Both car and large truck accident involvements were reduced, but large trucks were over-represented in accidents both before and after the energy crisis.

Greatest compliance with the 55 m.p.h. limit was achieved soon after it was imposed in 1974 largely because of reduced availability of fuel. As fuel became more available, compliance steadily decreased to the point where less than 30% of vehicles adhered to the 55 m.p.h. limit in some states by 1979, and fatalities have slowly increased. The American experience with the 55 m.p.h. (90 km./h.) national speed limit leads to the following conclusions:

(a) reduced speeds lead to a decrease in the number and severity of accidents,
(b) reduced speeds lead to reduced speed variability within a traffic stream, i.e. a more uniform pace,
(c) drivers must be convinced of the benefits of the reduced speed limit for voluntary compliance.

6.2.4. The Ontario Highway Traffic Act prohibits unnecessary slow driving. Section 113 states that:

> "no motor vehicle shall be driven on a highway at such a slow rate of speed as to impede or block the normal and reasonable movement of traffic thereon except when such slow rate of speed is necessary for safe operation having regard to all the circumstances".

Further, Section 126 requires slow moving vehicles to keep to the right side of multi-lane highways but this is frequently not done by motorists and is a source of great frustration to other drivers. The section states that:

> "any vehicle proceeding upon a roadway at less than the normal speed of traffic at the time and place and under the conditions then existing shall, when practicable, be driven in the right hand lane then available for traffic or as close as practicable to the right hand curb or edge of the roadway, except when overtaking and passing another vehicle proceeding in the same direction or when preparing for a left turn at an intersection or into a private road or driveway".

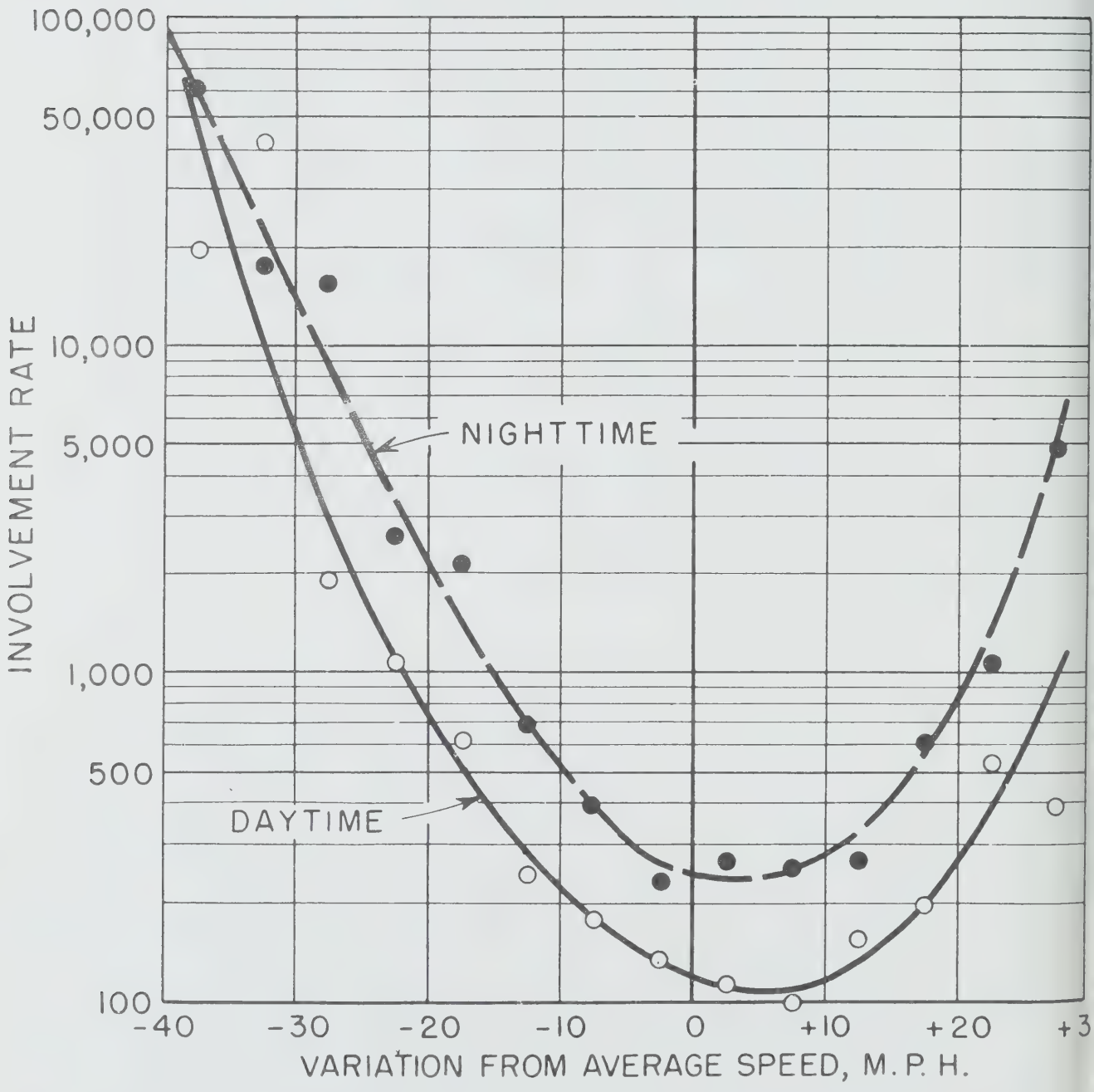
In 1981, 4,472 drivers in Ontario were convicted for failing to drive in the slow-moving traffic lane of a multi-lane highway and the O.P.P. laid charges against 60 truck drivers. The slow driving laws of the other Canadian provinces and the U.S.A. are substantially the same as those in Ontario, except that Quebec prohibits speeds less than 60 km./hr. on auto-routes which are the equivalent of the Ontario 400 highway series.

6.2.5. Solomon conducted a landmark speed study in 1964, based on a comparison of the speed behaviour of 10,000 accident-involved drivers and close to 300,000 accident-free drivers on two and four-lane U.S. rural highways. (See: Accidents on Main Rural Highways: U.S. Bureau of Public Roads). He concluded that the probability of accident involvement for any vehicle increases as the difference in speed between that vehicle and the average of all the traffic increases. (See Fig. 13). Solomon's findings show a U-shaped relationship between accident involvement rate and variation from average speed, with the minimum accident rate occurring slightly above the average speed. A higher risk of accident involvement is found at speeds both lower and greater than the average. The data also show that the difference between night-time and day-time accident involvement rate increases with increasing travel speed, with night-time driving being much less safe.

Solomon's findings have been confirmed many times, e.g. by the U.S. Research Triangle Institute in 1969, by Cirillo in 1969, by Minden for the U.S.

FIGURE 13

ACCIDENT INVOLVEMENT RATE
BY VARIATION FROM AVERAGE SPEED



Source: Solomon, D.: Accidents on Main Rural Highways, U.S. Bureau of Public Roads, 1964

Road Research Laboratory in 1967; and more recently by Haver et al in a study entitled: Speed Enforcement and Speed Choice, in 1980 for Transport Canada. The 1982 U.S. Large Truck Accident Causation study confirmed that the 55 m.p.h. national speed limit has served to reduce the speed differential between cars and trucks.

6.3. Manoeuvering

6.3.1. Following too close behind another vehicle is commonly known as "tailgaiting". Section 136(1) of the Ontario H.T.A. states that:

> "the driver of a motor vehicle shall not follow another vehicle more closely than is reasonable and prudent, having due regard for the speed of such vehicle and the traffic on and the conditions of the highway" and
>
> "the driver of a commercial motor vehicle, when driving on a highway at a speed exceeding 60 kilometres per hour, shall not follow within 60 metres of another motor vehicle, but this shall not be construed to prevent a commercial motor vehicle overtaking and passing another motor vehicle".

Except for Alberta, P.E.I., Saskatchewan and the North West Territories, most provinces have provisions similar to those in Ontario. However, there is some variation:

(a) Newfoundland - 150 metres (500 ft.)
(b) Manitoba & Quebec - 90 metres (300 ft.)
(c) Nova Scotia - 30 metres (100 ft.)
(d) Ontario & others - 60 metres (200 ft.)

Except for Ontario and Nova Scotia, all other provinces have an additional provision, generally prescribed as follows:

> "The driver of a motor vehicle in a caravan or motorcade, other than a funeral procession, when driving on a roadway outside a city, town or village, shall drive at a sufficient distance behind the vehicle next in front of him to enable an overtaking vehicle to enter and occupy the space so left without danger".

As far as commercial vehicles are concerned, Ontario Section 136 (2) accommodates such a requirement. In the U.S.A., eighteen states have set the minimum following distance at 300 feet (90 metres) and only four have the same as Ontario. We see that there is a very wide variation of permissible following distances. It is not surprising that the regulations are very difficult to enforce and "tailgaiting" is a major concern. Police officers must rely on subjective evaluations without the aid of technological devices like radar.

In Ontario, the penalty for tailgaiting is four demerit points. In 1981, only 15,400 drivers and less than 500 truck drivers, were convicted of following too closely. According to data supplied to the Commission by the O.P.P. the number of charges laid were as follows:

TABLE XVI

Type of truck	1979	1980	1981
straight trucks (including vans & pick-ups)	915	955	887
tractor-trailers	350	369	373
straight truck with trailer	54	63	64
Total	1319	1387	1324

Despite the pervasive incidence of tailgaiting and its large contribution to accidents by all types of vehicles, there are very low levels of conviction. The M.T.C. has been monitoring the traffic at the Whitby Weigh Scale on Highway 401, with a system of transducers imbedded in the road which, in combination with micro-processors, T.V. cameras and recorders can count and identify vehicles, determine their axle weights, the vehicle speed and the time of day. These detectors were not originally intended to be used for traffic management and safety but they could be. Some startling results have been obtained. Speeding by cars and trucks is endemic. For example, during the week of October 4 to October 11, 1982, 33% of the cars and 32% of the trucks were exceeding the speed limit of 100 km./hr. in the slow lane. Probably the worst case was on Friday, October 8/82 when 33 trucks were observed to be exceeding 120 km./hr. (75 m.p.h.) in the slow lane. This is not an isolated incident, for the research results show that it is normal for 10% of the trucks to exceed the speed limit in the slow lane by more than 10 kms./hr. No wonder motorists complain of trucks tailgaiting them!

The weigh-in-motion scale at Whitby is a prototype scale built and tested as part of a Road and Transportation Research Association of Canada research project jointly financed by Transport Canada, the provinces of Saskatchewan, Quebec, New Brunswick and Ontario and the University of Saskatchewan. The scale is now being produced commercially by International Road Dynamics Ltd. in Saskatchewan. The prototype at Whitby is being upgraded from the research to a production model.

6.3.2. Passing a vehicle going in the same direction is permitted by section 127 of the H.T.A. but passing on hills or curves is prohibited under section 128:

> "No person in charge of a vehicle shall pass or attempt to pass another vehicle going in the same direction on a highway unless the roadway
>
> (a) in front and to the left of the vehicle to be passed is safely free from approaching traffic, and
>
> (b) to the left of the vehicle passing or attempting to pass is safely free from overtaking traffic."

In 1981, 1,270 drivers were convicted of improper passing in Ontario. ACcording to the "Canadian Rules of the Road", February 28, 1982 publication, all other Canadian provinces and the Northwest Territories have an overtaking law quite similar to Ontario. However, all provinces except Ontario require that the left side of the roadway be clearly visible in addition to being free from oncoming traffic.

Section 127 (3) of the Ontario H.T.A. requires that vehicles being overtaken on the left must keep to the right and allow the overtaking vehicle to pass, while Section 127 (4) requires an overtaking vehicle to keep to the left as far as may be necessary to avoid a collision with the vehicle being overtaken. The driver of the overtaken vehicle is not required to leave more than one-half of the roadway free. In 1981, 174 drivers were convicted for failing to keep to the right while being overtaken, and 450 drivers were convicted for improperly overtaking other vehicles on the left.

Passing to the right of a vehicle is allowed in Ontario under Section 129 (1) of the H.T.A., which states:

> "The driver of a motor vehicle may overtake and pass to the right of another vehicle only where such movement can be made in safety and
> (a) the vehicle overtaken is making or about to make a left turn or its driver has signalled his intention to make a left turn;
> (b) is made on a highway with unobstructed pavement of sufficient width for two or more lines of vehicles in each direction;
> or (c) is made on a highway designated for the use of one-way traffic only.'

Section 129 (2) prohibits overtaking and passing of another vehicle by driving off the roadway and in 1981, over 3000 drivers were convicted for this offence. The passing of trucks by small cars on the right side for multi-lane freeways is seen by many truck drivers to be a particularly unsafe practice, due to the reduced visibility or blind spot to the right of the truck.

All Canadian provinces and the Northwest Territories have rules pertaining to overtaking on the right which are quite similar to the Ontario law, and the U.S. Uniform Vehicle Code (U.V.C.) S.S. 11-304 is also quite similar.

6.3.3. Section 133(a) of the Ontario H.T.A. prohibits unsafe lane changes, and states:

> "Where a highway has been divided into clearly marked lanes for traffic, a vehicle shall be driven as nearly as may be practicable entirely within a single lane and shall not be moved from such lane until the driver has first ascertained that such movement can be made with safety".

In 1981, over 5600 drivers were convicted in Ontario for unsafe lane changing. All provinces except Alberta, Newfoundland, Prince Edward Island and the Northwest

Territories have a general law governing lane manoeuvering similar to that in Ontario, as does the U.S. Uniform Vehicle Code. Furthermore, most jurisdictions require that the operator of a vehicle must first ensure that a lane change can be made safely and must give a plainly visible signal of intention before starting the manoeuver. The province of Quebec now prohibits lane-hopping, which it defines as a zig-zag pattern of successively passing two or more vehicles on a one-way road having two or more traffic lanes.

The M.T.C. 1982 "Commercial Vehicle Accident Survey" found improper passing or lane changing to be a significant driver-related accident cause, second only to excessive speed. The study found that passing and lane change manoeuvers on high-volume freeway sections (e.g. Toronto 401 Bypass) are difficult to complete safely because inter-vehicle spacing is greatly reduced. In 1981 the O.P.P. laid charges against only 538 truck drivers for unsafe lane changes and 972 for improper passing, while 1300 motorists were convicted of improper passing and over 5600 for unsafe lane changes. Improper passing and lane changing laws are just as difficult to enforce as tailgaiting (as the low charge and conviction rates would indicate).

6.4. Traffic Management

6.4.1. At present, the Ontario Ministry of Transportation and Communications defines freeway traffic management as "a concept for managing the traffic flow on freeways in order to obtain the maximum use of the freeway system under varying roadway and traffic conditions". Note that this policy makes no mention of safety. The M.T.C. freeway traffic management objectives include: reducing congestion; rapidly detecting and removing incidents; improving merging; smoothing traffic flow and warning motorists of bad road conditions. The M.T.C. freeway traffic management system includes: a centralized computer data storage; analysis and system control; camera surveillance; vehicle flow detection; ramp metering; variable message signs and special lane designation signs. It has been quite successful and has produced a 22% reduction in the number of collisions. The Ministry currently employs three basic types of electronically actuated message signs:

(a) overhead changeable message signs
(b) speed 'too fast' signs
(c) overheight vehicle warning signs
(d) detection devices embedded in the road
(e) C.B. radio channel 9 monitoring
(f) lane designation signs for trucks
(g) M.T.C. and O.P.P. patrolling vehicles

An overhead changeable message sign has been installed on the Q.E.W. in Southern Ontario since April 1979. This sign can display twenty-two pre-programmed messages and any special message. It is intended to increase driver awareness of conditions ahead, decrease the risk of accidents, decrease the frequency of last minute manoeuvers and reduce traffic congestion. The messages often include a description of the traffic volume or congestion and adverse weather.

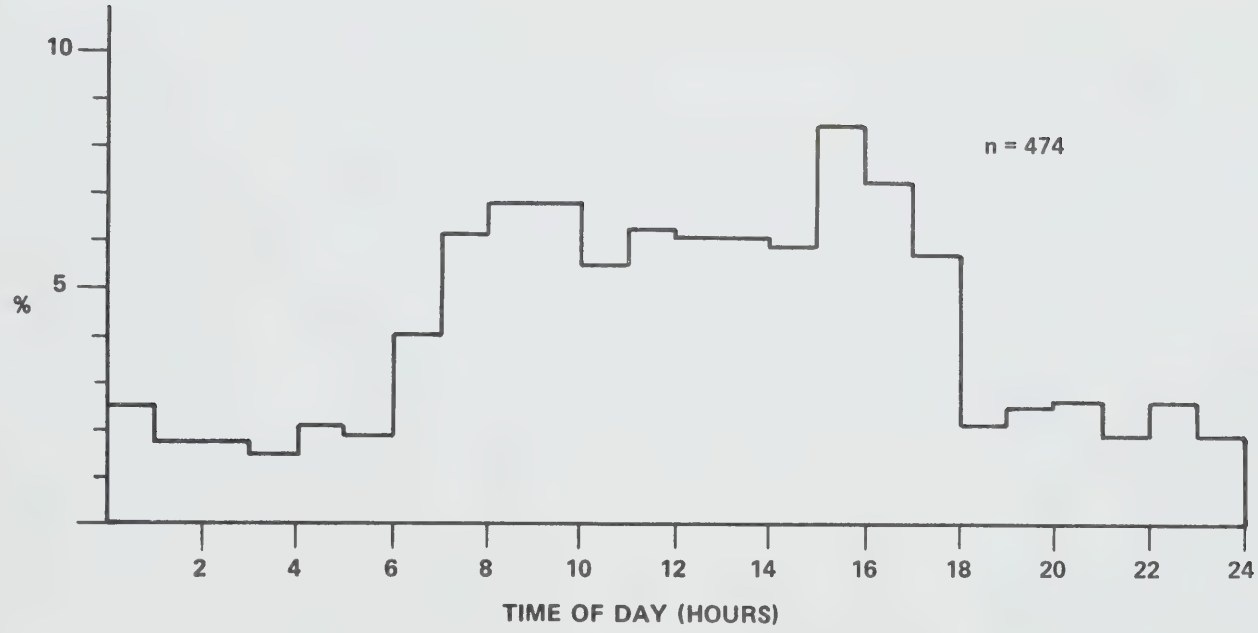
The M.T.C. speed 'too fast' signs require a detection mechanism, speed analysis and then sign activation. One of these types of signs was in operation at Highway 400/401 from May 1977 to September 1980 and a 15% reduction in accident resulted. Greater reductions are anticipated with continual use. Another speed 'too fast' sign was installed at Highway 11/169 in May 1979 where the truck accident record had been poor. Prior to the installation (between 1974 and 1979) there were ten truck accidents at this location but after installation (between 1979 and June 1981) there were none. Overheight vehicle warning signs are activated by an electronic beam. These warning signs were installed at three test locations in 1980 and the preliminary indication is that there has been a substantial reduction in damage.

6.4.2. The Ontario Motor League in a Commission interview expressed concern about the high frequency of highway traffic delays due to truck breakdowns or truck accidents. These occurrences create undue frustration in other motorists and sometimes result in rear-ending as the speed of the traffic slows abruptly. The O.M.L. suggested that such traffic delays should be recorded and recognized as part of the truck safety problem.

A 1982 report by Abrahamsohn et al of M.T.C. entitled: The Highway 401 Freeway Corridor Traffic Management Study, noted that lane blocking incidents due to stalled vehicles or collisions were very significant contributors to traffic delays in the peak traffic periods. It was estimated that incidents in 1982 on the 401 Freeway resulted in 540,000 vehicle hours of delay, and heavy vehicles were cited as having approximately three times the breakdown rate of light vehicles. The clean-up period for heavier vehicles generally is longer and the subsequent disruption of traffic flow is greater.

A study of the Q.E.W. Corridor between Highway 20 and the Guelph Line (16 kilometres in length and consisting of a four-lane divided freeway with controlled access) indicated that there are approximately 1,000 delays per year with the largest proportion being caused by vehicle breakdowns, and the remainder almost evenly split between accidents and bridge maintenance. The average duration of an incident is approximately 30 minutes with vehicle breakdowns peaking at 15 minutes and accidents and bridge maintenance averaging in excess of 30 minutes. It was estimated that 93% of the accidents result in one-lane closures and the remaining 7% result in two-lane closures. The Commission received more complaints about the delays caused by truck breakdowns and accidents than by their slowness on grades. Fig. 14 is from the M.T.C. Commercial Vehicle Accident Survey and shows the hourly distribution of C.A.V. accidents on the Highway 401 Toronto Bypass at Keele St. and correlates with the hourly distribution of traffic. See also Fig. 11 in Chapter V.

6.4.3. It was suggested several times to the Commission both by truck drivers and by motorists that total separation of the two classes of vehicles would significantly increase both the safety and comfort of high volume freeway driving. In areas of highest truck and total traffic volumes, parallel but separate three-lane highways could be constructed for the two vehicle classes. The parallel but independent roadways would be separated by barriers but service areas would be mutually accessible. This proposal is not practicable because the areas of highest truck and total traffic volume are often the areas of highest urban development. Alternatively it has been suggested that separate highways be constructed which would allow through vehicles to bypass the high traffic urban freeway system. Unfortunately, this was the original intent of many existing urban freeway systems but as the urban area expands, the bypass becomes inte-



Hourly Distribution, CAV Accidents, OPP Data Hwy 401 Bypass

FIGURE 14

Source: Ontario Ministry of Transportation and Communications, Commercial Vehicle Accident Survey, 1982, Report RR-235

grated into the urban commuter traffic and loses its bypass capability. Lower urban freeway traffic volume ought to lead to lower accident rates and, if a significant number of commercial vehicles use a bypass, the severity of the urban freeway accident should decrease. However, if reduced traffic congestion only results in higher speeds, then safety may not be improved.

In his 1982 Study of the 401 Bypass, Lau concluded that:

> "It is apparent that the stretch of the MacDonald-Cartier Freeway in Metro Toronto functions primarily as a major urban expressway and serves a secondary function as the Toronto Bypass. The majority of traffic it carries is related to work-commuting and business purposes. They dominated the traffic volume in two 2 to 3 hour periods of the morning and afternoon; most of the work trips travelled an average distance of 32 km. (20 miles). The average car occupancy rate was about 1.3 persons per vehicle.
>
> The data also reveal several areas of concern. Due to the heavy volume of traffic during the peak periods, the speeds on various sections of the highway were greatly affected. With various sections of the highway having different operating speeds, it not only reduces the overall operating efficiency of the facility but also poses safety considerations. Another concern comes from the significant increase of heavy trucks mixing with an increasing number of smaller passenger cars in the traffic streams. Since 80% of the commuters on the highway drive alone, there is considerable room for car pooling to reduce the growing demand for capacity during the peak periods of the day."

It is clear that the 401 Metro Toronto Bypass has exceeded its capacity on many stretches so that a new Outer Bypass or Ring Road is greatly needed.

6.4.4. In response to the growing truck and total traffic volume on several urban freeways, the Ontario Government introduced legislation allowing a municipality to prohibit the operation of a commercial motor vehicle in the left lane of any highway under its jurisdiction (if it has three or more lanes in each direction and if the maximum speed is 80 kilometres per hour or more). By confining trucks to the right and centre lanes, a more orderly flow was effected. This partial separation of commercial and passenger car traffic was generally well received by the motorists but several truck drivers have written to or appeared before the Commission complaining about these truck lane restrictions. Many of these truck drivers do stay in the right lane unless they intend to pass. The centre lane becomes the truck driver's passing lane but many motorists use the centre lane as their slow lane rather than the right hand lane. This practice is

illegal and frustrates many truck drivers who, unfortunately, then try to intimidate the motorist by tailgaiting them or by blasting on their horn.

6.4.5. There are two reasons for limiting truck traffic in urban areas: the truck's physical size and the environmental consequences. Long and heavy trucks may be unsuited for narrow city streets, sharp corners and bridges of inadequate capacity and truck noise, vibration and noxious emissions may be deemed unsuitable for many streets. Truck restrictions may be temporary or permanent and include such strategies as banning truck traffic on municipal streets during rush hours and night time, or restricting pick-up and delivery activities to off-peak hours. Permanent restrictions include the direct prohibition of truck traffic from entire residential areas or specific streets.

The Municipal Act does not provide municipalities with the authority to establish routes for dangerous goods, but the Association of Municipalities of Ontario recently has recommended that they be allowed to designate dangerous goods routes within their own jurisdictions, subject to the approval of the Minister of Transportation and Communications. The Ontario Trucking Association is strongly opposed to this recommendation. It was felt that giving the power to designate dangerous goods routes to the municipalities would be unmanageable. The Hazardous Materials Transportation Act in the U.S.A. now grants the Department of Transportation the authority to regulate the transportation of hazardous materials. Prior to the mid-1970's, the U.S. D.O.T. had not identified a need to implement routing regulations but a number of states and local governments passed, or proposed, ordinances that restricted the transportation of certain dangerous goods, such as radioactive materials. So on January 19, 1981, the U.S. D.O.T. published requirements for radioactive materials which established the Interstate Highway System as the preferred route, with provisions for the states to establish alternative routes after consultation with local jurisdictions. In developing their rule, three basic principles were applied:

(a) route selection should be based on some valid measure of risk to the public,
(b) uniform and consistent rules for route selection were needed,
(c) local views should be carefully considered.

The U.S. D.O.T. can review the appropriateness of a particular state or local routing requirement. Should the routing requirement be deemed to be extreme, the D.O.T. may issue an "inconsistency ruling" which pre-empts the state or local routing requirement.

6.4.6. The Commission has received numerous complaints about Sunday trucking and its relation to the safety of weekend and holiday traffic. Many citizens do not understand that the regulation of Sunday use of the highways of Ontario by truckers

is subject to the Lord's Day Act which is a law of the Government of Canada, not of Ontario. The Lord's Day Act is enforced provincially under the authority of the Attorney General and its intent since 1907 has been to prohibit the transaction of ordinary business from midnight Saturday until midnight Sunday. However, the only enforcement of this prohibition against the transportation of freight appears to have been against trucks, as airlines and railways appear to have been able to operate on Sundays in disregard of the Act.

Under Section 11, the Act provides exemptions for emergencies, works of necessity or mercy, the care of perishable products and freight traffic:

> "Any work that the Canadian Transport Commission, having regard to the object of this Act, and with the object of preventing undue delay, deems necessary to permit in connection with the freight traffic of any transportation undertaking."

Note that this says nothing about safety. Many organizations, including the Canadian Automobile Association, the Ontario Law Reforms Commission, the Law Reform Commission of Canada and the Canadian Labour Congress, have objected strenuously before the Canadian Transport Commission about the very large number of truck exemptions which have been granted. The facts are that from 1969 until the end of 1981, out of 115 applications the C.T.C. granted all but two the authority to operate trucks in Ontario on Sunday.

The C.T.C. may also grant "Temporary Exemption Orders" to carriers, providing for a one-time exemption from the regulation. There has been some debate over whether or not the Lord's Day Act applies to private carriers as it applies to "for-hire" carriers, but the C.T.C. has granted Sunday exemptions to some private carriers, thereby asserting its jurisdiction. Special permits for the haulage of overlength or overwidth loads (issued by M.T.C.) are not available for moves on Saturday, Sunday or holidays. Sunday trucking is not allowed in Ontario before 11.00 p.m. except for exempt carriers and, by a long-standing arrangement, prosecutions have not been laid against persons operating prior to 8.00 a.m. and after 10.00 p.m. on Sunday. The O.P.P. maintain a file of companies known to hold permits in Ontario and others are stopped and charged. In 1980 the O.P.P. found that of 145 commercial vehicles checked on Highway 11, 78 had C.T.C. permits, 22 were exempt under section 11, and 40 were violators.

The Ontario M.T.C. has intervened and appeared before the Motor Vehicle Transport Committee of the C.T.C. in several applications by truck firms where the Ministry felt the traffic could move adequately on days other than Sunday. The Ontario M.T.C. feels that on Sundays, the roads should be freed as much as possible for private and recreational travel. However, the C.T.C.'s response has been that M.T.C.'s concerns are outside the terms of reference of their Committee. In 1977 the City of Hamilton and M.T.C. appealed a C.T.C. decision

to the Supreme Court of Canada. The ruling was unanimous and upheld the C.T.C. decision. In its decision, the Supreme Court stated:

> "In my opinion, the only issue to be determined by the Commission under paragraph 11(x) was whether, having regard to that object, the employees of the carriers should be exempted from the prohibition against their working on Sunday with the object of preventing undue delay in connection with the freight traffic of the carriers. This was its limited mandate under that paragraph. It was not reqired or authorized to conduct a general enquiry into the impact upon the citizens of Hamilton of Sunday trucking operations."

The Law Reform Commission of Canada concluded in its 1976 Report:

> "The C.T.C. under Section 11(x) can virtually neutralize the prohibitions of the Lord's Day Act in respect of the freight traffic of any transportation undertaking, at its discretion. The exclusion by the C.T.C. of evidence of road congestion and the need for safety on the roads, though understandable on a technical level (i.e. as per Section 11(x) of the Act), underscores the inappropriateness of the Lord's Day Act as the vehicle for creating the C.T.C.'s regulatory jurisdiction in this area under modern conditions. The substantive interest in road safety and prevention of road congestion is real and genuine, and that interest should not be thwarted by an anachronistic legislative framework which was created many years ago for substantially different objects."

The Law Reform Commission of Canada recommended in their report that the Lord's Day Act be repealed. It was their belief that Sunday trucking regulations should come within the framework of motor vehicle transport legislation and not Sunday observance legislation. While there may well be a case for applying special Sunday conditions to trucking firms (based on a recognition of Sunday as a day on which there is increased recreational driving), these special conditions should not be imposed under the federal Lord's Day Act but through amendments to federal transportation laws (i.e. Motor Vehicle Transport Act). This power could again be given to the C.T.C. as at present, but the C.T.C. should then be required to consider traffic congestion and safety, as well as undue delay. It may be argued that this function should be delegated to the provinces. However, this would pose problems of disparate regulations between provinces for interprovincial carriers. On the other hand, the Ontario Law Reform Commission had proposed that Sunday trucking should be wholly regulated by the provincial highway transport boards, including interprovincial trucking, and the Government

of Canada should be requested to amend section 11(x) of the Lord's Day Act to reflect this arrangement.

Another aspect of the Act tending to neutralize its impact in a modern setting is the low level of fines prescribed for violations. As a result, M.T.C. activity before the C.T.C. in this regard has since been limited. Applicants continue to obtain Sunday operating authority. Other provinces find themselves in the same position. M.T.C. accident data for 1981 show that 400 trucks were involved in accidents on Sundays and 15 of these involved fatalities. In other words, on the average Sunday somewhere in Ontario there are about eight truck accidents and two of them involve injuries as well as damage.

The Commission received many letters and formal submissions, objecting to the present situation, and most of these recommended restricting or prohibiting Sunday trucking with varying provisions for emergencies. These included the O.P.P., the Teamsters Union, the Association of Municipalities of Ontario, the Hamilton Automobile Club, the Ontario Motor League, the Select Committee of the Legislature on the Highway Transportation of Goods 1977, and the Ontario Interministerial Committee on Sunday Trucking. The latter recommended that trucking be prohibited between 3.00 p.m. and 10.00 p.m. on Fridays, Sundays and holiday Mondays but provided exemptions for works of mercy, perishable products, livestock, road maintenance and the Royal Mail. The Interministerial Committee recommended that section 161 of the Ontario Highway Traffic Act should be amended. The Ontario Trucking Association objected strenuously to the Friday evening proposal on the grounds that banning Friday would throw the whole economy out of kilter and that it would be just as logical to ban cars from travelling to cottages on Fridays (and the latter action would probably improve accident statistics more than banning trucks).

6.4.7. Although more truck drivers wear their seat belts in Ontario than in the United States, many truck drivers admit to not wearing them because of the discomfort caused by vibration and heat. Several drivers reported they resented being told to wear seat belts by the Government, and several felt unsafe wearing them and suggested that they would prefer to jump from the vehicle rather than be crushed by the load they were carrying. The U.S. B.M.S. has suggested that many of the truck driver cab ejections in accidents are actually due to the driver choosing to jump. The greater incidence of truck rollover makes unrestrained driver ejection from the cab more likely than from passenger cars. Recent U.S. D.O.T. data show that truck drivers ejected from the cab are four times more likely to be fatally injured than if kept in the cab by the seat belt. Even if the unrestrained driver is not ejected, he may be seriously injured while being thrown around inside the cab. Partyka in a report entitled: An Analysis of Available Data for Car - to - Heavy Truck Accidents and the Underride Problem,

1979, prepared for the U.S. N.H.T.S.A. found that driver ejection from the cab was associated with up to 40% of the fatalities. It was estimated that approximately 97% of all fatally injured occupants were not wearing seat belts.

The rate of seat belt use in the U.S. is estimated to be the same for truck and passenger car drivers, approximately 10-15%. In Ontario, all drivers are required to use their seat belts; however where a motor vehicle was manufactured or imported into Canada prior to January 1, 1974, the driver and passenge are exempt from wearing the upper torso restraint. Drivers who are engaged in work which requires leaving and re-entering a motor vehicle at frequent intervals and who do not drive at a speed exceeding 40 kilometres per hour are exempt. The seat belt usage rate in Ontario by truck drivers is not known. Because the driver is often sitting higher in the cab, it is difficult for investigators to determine if the driver is wearing a belt and enforcement of the mandatory usage law is difficult.

6.5. THE COMMISSION RECOMMENDS:

(1) The maximum speed limit for all highways in Ontario should be 90 kms./hr. especially for commercial vehicles. If the Government of Ontario rejects lowering the limit throughout the province for automobiles, then it should designate 90 km./hr. maximum for routes which have endemic traffic congestion or high accident rates, and enforce the 90 km./hr. limit for commercial vehicles.

(2) The Ontario 60 metre permissible following distance should be increased to 90 metres and the penalties for violation made more severe.

(3) The M.T.C., the O.P.P. and the trucking and automobile associations jointly should undertake a public education program about the hazards of tail-gaiting, lane hopping, driving in the truck passing lane and entering the path of a heavy truck too slowly.

(4) The M.T.C. should accelerate its Traffic Management Program and include safety as a critical ingredient of its policy. Overhead changeable message signs, speeding too fast signs, and electronic monitoring of traffic have proven successful and should be implemented wherever traffic congestion or high accident rates are endemic.

(5) The M.T.C. should accelerate any plans it may have for the provision of alternative truck routes for the Niagara Falls, Hamilton, Metro Toronto, Oshawa problem area. Planning should proceed as soon as possible for an additional outer Ring Road with appropriate truck access routes, for the Metropolitan Toronto area.

(6) Municipalities should be given the authority to regulate both the times and routes for trucks and for the transportation of dangerous goods within their jurisdiction, except for provincial highways, which should remain the responsibility of the Ontario Minister of Transportation and Communications.

(7) The Government of Canada should amend the Lord's Day Act in the manner recommended by the Law Reform Commission of Canada in 1976. Failing that, the 1975 recommendations of the Interministerial Committee on Sunday Trucking, for both Sunday and weekend trucking, should be implemented and the appropriate amendments made to the Ontario Highway Traffic Act.

(8) Truck manufacturers must be encouraged to develop more comfortable seat belt assemblies for truck drivers and their use should be enforced.

CHAPTER VII COMPLIANCE

7.1. Risk Acceptance

7.1.1. The perception of risk, the actual risk and the acceptance of risk are not necessarily the same. The actual risk of an accident may be very small but it may be perceived to be very large, and vice versa. People may refuse to accept levels of risk in some activities which they accept regularly while driving. What is considered acceptable is a very complicated function of the actual risk, the perceived risk and the skill, knowledge and temperament of the driver. There is a debate among psychologists about the relative importance of cognitive skills and the recognition of risk. The weighing of risks and benefits calls for personal value judgements and is affected by many factors. The acceptability of a risk tends to decrease the more involuntary it is, and usually no risk is considered to be acceptable if it is easily avoided. In a paper in Scientific American February 1982, Upton compared the actual risk of death with the perceived risk, for thirty common human activities all the way from using food preservatives and spray cans through having surgery, riding a motorcycle and smoking. Table XVII shows the ranking of the actual risk along with the perceived risk of the ten most hazardous activities as seen by: a group of women, a group of college students and a group of businessmen in the U.S.A.

TABLE XVII

Rank	Actual Risk of Death	Perceived Risk of Death		
		by women	by students	by businessmen
1	Smoking	nuclear power	nuclear power	handguns
2	Alcohol	motor vehicles	handguns	motorcycles
3	Motor vehicles	handguns	smoking	motor vehicles
4	Handguns	smoking	pesticides	smoking
5	Electricity	motorcycles	motor vehicles	alcohol
6	motorcycles	alcohol	motorcycles	fire fighting
7	swimming	aviation	alcohol	police work
8	Surgery	police work	police work	nuclear power
9	X-rays	pesticides	contraceptives	surgery
10	Railroads	surgery	fire fighting	hunting

The risk of death by a motor vehicle accident actually ranks third in the U.S.A. after death due to smoking and the abuse of alcohol. The younger students placed motor vehicle accidents too low but the older women and businessmen ranked them correctly. According to Upton, in the U.S.A., smoking three cigarettes a day, driving 60 miles in an automobile or crossing the ocean by air, all have about the same risk of death: the first from lung cancer or heart disease, the second by an accident and the third from cancer due to cosmic rays. The general public accepts all such risks regularly but can be very upset by the

involuntary exposure to much less risk of death from hazardous substances like pesticides.

The motoring public can be divided into two basic categories concerning risk perception. In the first category, a driver perceives that a risk exists and evaluates his chances of becoming involved in an accident or apprehended by a police officer. In the second category, the driver fails to perceive any risk whatsoever. Many people come to Ontario from other parts of the world and are used to driving in very warm, dry climates. When driving in snow for the first time, some continue at the speed limit, not recognizing the inherent risks of driving in snowy conditions. Other people with no understanding of the mechanical aspect of their vehicles perceive no risk in driving an unsafe vehicle.

An individual's risk perception can be positively influenced in two main ways: by increasing police presence so that a driver is less likely to take a chance when he knows that there is a high probability of being caught; and secondly by improving driver education and standards so that a driver is better able to recognize a safety risk and be better able to react properly.

7.1.2. Wilde, in an article entitled: Rewards and Punishment in Traffic Safety, 1982 has developed a theory of human behaviour and the acceptance of risk, called the theory of "risk homeostasis" or risk compensation. There are surprises in human behaviour which his theory helps to explain. For example, early one morning in September 1967, Sweden changed over from left-hand to right-hand traffic but, instead of the anticipated increase in accidents, a major decrease occurred. Everyone was being careful. Fatalities were reduced by as much as 17%, but two years later, the original accident rate had returned and no lasting effect could be observed. Similarly, when Canada introduced its breathalizer law in 1969, no measureable change in road deaths occurred. It had been hoped that the death rate would fall because it was known that alcohol contributed to a very large number of fatal accidents.

Wilde's theory is analogous to the thermostatic temperature control of a room in that the perceived level of risk of a motor accident corresponds to the temperature of the room, while the desired level of risk corresponds to the desired temperature. If the actual temperature differs from that desired, switche come into play automatically which adjust the temperature. Similarly, if the level of risk of an accident rises, or if the driver perceives it to have risen, he will take action to return it to the level which is acceptable to him. Wilde calls this the "target level of risk". This level varies widely between drivers, because there are risk-takers and risk-avoiders, and it even varies considerably for the same individual, depending on a host of physical and psychological factors A truck driver under pressure to meet a deadline may accept risks which the same driver would not accept under more leisurely circumstances or while driving his

own car. The target level of acceptable risk appears to be extraordinarily high for many motorists compared to lower risk levels they refuse to accept in other activities.

The perceived level of risk is affected by whether or not the driver knows the actual risk being taken, but also by his ability to react and to take appropriate corrective action. All three can be improved by education, correction and practice. The output of any homeostatically controlled process is fluctuation about a mean and the extent of oscillation depends on these corrections. If there is an improvement such as the introduction of better anti-jack-knife devices, there should be a decline in the accident rate, provided the driver's motivation does not change. Wilde contends that what really happens is that drivers adjust their behaviour in such a way that the accident rate continues to match their own target level of acceptable risk. In other words, drivers operate in such a manner that the number of accidents per unit of time remains constant. Accident counter-measures may bring down the accident rate per mile, but per hour of exposure it will remain roughly constant and, on a per capita basis, it may even go up!

Wilde contends that motivation to improve safety, i.e. to lower the target level of risk, is more important than skill. This may be achieved by incentives and persuasion or by enforcement and penalties. He identifies four possible tactics for an accident prevention strategy:

(a) decrease the benefits of risky behaviour, e.g. pay drivers by the hour, not by the kilometre.
(b) decrease the costs of cautious behaviour, e.g. make seat belts cheap and comfortable.
(c) increase the benefit of cautious behaviour, e.g. reduce insurance premiums for safe drivers.
(d) increase the cost of risky behaviour, e.g. increase fines and licence suspensions for unsafe drivers.

As was pointed out to the Commission by G. Hemsley, Research Officer with the Ontario M.T.C., this concern for and emphasis on the driver as a cause of accidents is appropriate according to the accident statistics, but risk is not the only factor which must be considered. Accidents are caused by a complex interaction of behaviour, the mechanics of vehicles and the environment, and there is a body of scientific literature which treats risk perception as a cognitive skill rather than motivational. This approach does not assume drivers are motivated to take risks, but rather that they make incorrect or hazardous decisions because of lack of knowledge or experience. The distinction between a cognitive and a motivational approach is crucial to the types of safety programs which might be mounted. The former approach may devote too much reliance on "techno-

logical fixes" and punishment, while the latter may be too pessimistic about the effect of technical improvements and too optimistic about the ability to improve motivation.

7.1.3. The St. John Ambulance in their presentation to the Commission at the London public hearing recommended:

> "That regulations be amended to provide that all drivers of commercial vehicles be required to attend a first-aid for drivers course as a minimum licensing prerequisite and that all trucks and buses be required to carry and maintain first aid equipment".

Their brief also recommended that evantually all drivers be required to take a short course in first aid as part of their driver qualifications. The St. John Ambulance brief noted that there is a positive relationship between first aid training and avoidance of risk. A number of briefs have been made in the past to M.T.C. and to the Ontario Select Committee on Highway Safety, recommending that bus drivers and transit vehicle drivers be required as a licensing pre-requisite to take first aid training. In the past, the trucking industry has objected to making first aid training mandatory because of the length of the training time and the resulting limitations on the availability of drivers.

Several European countries have compulsory first aid training laws for various sectors of the driving public. For example, Switzerland requires ten hours of training, West Germany five hours and Norway two hours. British Columbia has made it mandatory that trucks carry first aid equipment. Several large privat truck and school bus fleet operators have been training their drivers in first aid for some time and a few Community Colleges provide training for apprentices and heavy transport drivers.

Section 51(11) of the Ontario Workers' Compensation Act establishes the Workers' Compensation Board's right to require the provision of first aid equipment and first aid stations. The trucking industry is included under Schedule 1, class 20 which provides for "carting, teaming and trucking". A company employing not more than five employees on any one shift is required to maintain a first aid station and an employee in charge who works in the immediate vicinity and is a holder of a St. John Ambulance Emergency First Aid Certificate or its equivalent. If there are more than five employees in any one shift, a similar but larger first aid kit is required. Class 20 of the W.C.A. includes 10,000 firms of varying size and 6,500 of these are engaged in trucking of one kind or another. Of these 90% employ ten persons or less and 60% are operations employing only one or two people.

The St. John Ambulance Society noted that first aid training produces a favourable attitude change in the trainee toward hazards and accidents, because

the training prepares the individual to react positively in an emergency to save lives and minimize the consequences of an injury. A short safety-oriented first aid course for drivers can be taught in one session. Labour unions are in full support of St. John Ambulance training.

7.1.4. Because a substantial number of truck drivers have received training in how to manage an accident scene, they frequently can be of considerable help to the police and to the medical profession. Any person involved in a motor vehicle accident must stop and give all possible assistance to the persons involved. The law also requires that, once we have accepted responsibility for giving emergency assistance to an accident victim, we must continue to give help until another person is able to take over - the desirable person being one with medical training. There is a natural desire to help someone in an emergency, but at times, both motorists and truck drivers may be afraid of the responsibility incurred and concern has been expressed to the Commission about legal liability.

What the law looks for is a common-sense approach from anyone who stops to help in an emergency. The law does expect us to be cautious as one would not want to cause more harm than good. At an accident, if one is trained in first aid, say so, and if the victims are conscious, ask if they want help, because they have the right to refuse assistance. If the victims are unconscious, extend any urgent care necessary.

While no specific "Good Samaritan" statute exists in Ontario, the Attorney General has assured the public that "you can feel confident that if you act reasonably in giving emergency assistance, you will not be found liable if someone later decides to take legal action. The law is quite clear: whether you have medical training or not, the courts expect you to do only what is reasonable, considering the situation and your skills. (See the pamphlet published in 1982 entitled: It Doesn't Hurt to Help).

7.2. Sanctions

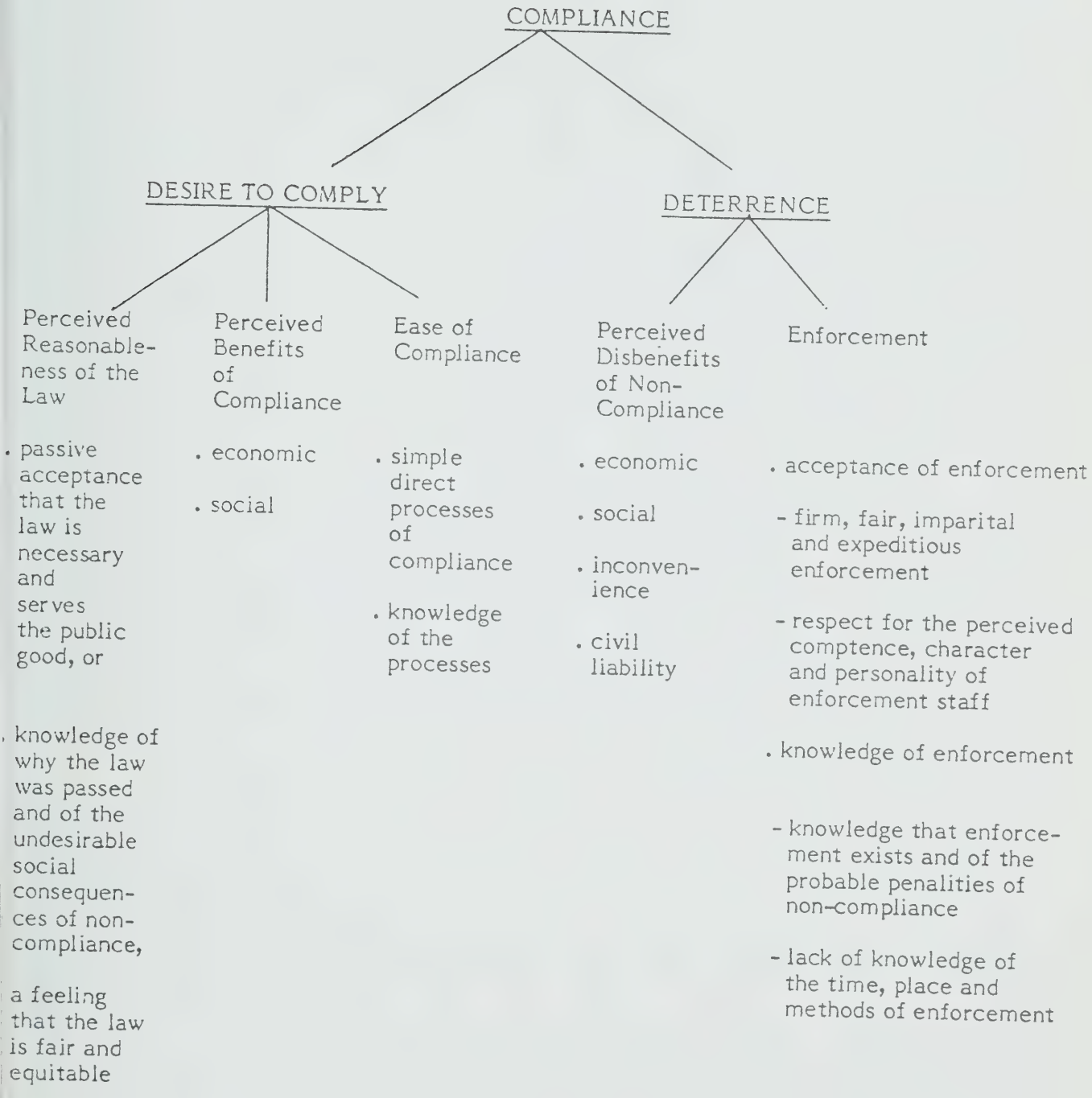
7.2.1. Despite the difficulties,our traffic laws must be administered and enforced in order to protect the innocent public from the hazards caused by traffic safety violators. Violations of administrative law are not crimes in the same sense as violations of the criminal code, although this nice distinction may not be apparent to victims. (See Sanction, Compliance Policy and Administrative Law, 1981 by H.R. Eddy, Federal Law Reform Commission). The M.T.C. current policy toward the problem of compliance with traffic laws is that effort should be directed toward helping individuals assume responsibilities and a more positive approach to regulation, with the long run prospect of reducing government expenditure on intervention. It is hoped that the result will be more compliance and less intervention. C.R. Wilmot, Executive Director of the new Compliance Section of the Ontario M.T.C., a report entitled: Compliance, 1982, points out that it has two components: the desire to comply and deterrence (see Fig. 15). The greater the desire to comply, the less deterrence is required, and both of these are affected by the perceived benefits and reasonableness of the law. Given that no law can be designed so that every person will be motivated willingly to comply, it is important that there be appropriate deterrents and that negative consequences flow from undesirable behaviour, i.e. non-compliance will bring punishment through demerits or fines. In a few cases, no amount of persuasion, education, or incentive will achieve compliance and the only recourse is to remove the person's abilities to break the law through suspension of licensing privileges or even imprisonment.

There is a spectrum of compliance measures applicable to: those who believe they are above the law; those who are unwitting violators; those who believe the law is good; those who passively accept the law. Such measures should include:

(a) explaining the law, the principles on which it is based, and the need
(b) ensuring that the administration is simple, direct and convenient.
(c) identifying the penalties clearly.
(d) enforcing the penalties firmly and fairly.
(e) removing the offender's ability to offend.

There has been little attempt to determine compliance rates for The Ontario Highway Traffic Act, the Public Commercial Vehicles Act or the Motor Vehicle Transport Act of Canada, at least not in a quantitative manner, but a promising study has been done by the M.T.C. Policy Planning and Research Division entitled: Truck Compliance Rates, 1981.

FIGURE 15



THE COMPONENTS OF COMPLIANCE

Source: Compliance
M.T.C., 1982

7.2.2. The Ontario Trucking Association in its submission entitled: Safe Trucking is Good Business, made a very compelling case for the importance of the acceptance of responsibility, which leads to a strategy of self-regulation and surveillance. According to the O.T.A., the only way to reduce the risk of accidents is through responsible behaviour. Of three parties involved in vehicle safet the owner, the driver and the government, the greatest burden of responsibility belongs to the owner. This situation stems from the owner's ability to imbue an organization with a particular management style and this results in different climates within which employees carry out their day to day activities. Despite these different characteristics, there is an obligation on the owner to ensure that the firm operates within the framework of the law, and this is especially true of truck operators who must share the road with the motoring public. There are many ways that this obligation can be passed on to employees in order to provide for the best operating condition. Some of the instruments include: good vehicle maintenance, good driver training and selection and rewards for good safety records.

When a carrier starts to transgress the legal bounds or when his employees do so without punishment, the company becomes irresponsible. If these violations become rampant, then the owner should lose his right to operate vehicles, because when a carrier shows disdain for responsible actions, poor safety habits are sure to follow. It is the responsibility of the owner to operate safely and it is the responsibility of government to set the limits and then to ensure that, if the limits are crossed, the transgressor is forced to pay an appropriate penalty.

7.2.3. As the licensing authority, the provincial government has the responsibility for maintaining records of traffic convictions, licence suspensions and offences. The Ontario demerit point system provides a means of monitoring offences and controlling driver performance. Each driver starts with zero points and accumulates demerits for offences which range from two to seven points. Drivers receive a warning letter after six points and if they collect over nine points, they are interviewed and may have their licence suspended. At over fifteen points there is a thirty day suspension. If a probationary driver receives more than six demerit points, he is placed on suspension for thirty days. Demerit points are cancelled two years after a conviction but the record of conviction is kept for public access for three years. In addition, there are mandatory licence suspensions for specific convictions under the Criminal Code of Canada and the Public Commercial Vehicles Act. The Ontario government also conducts interviews of drivers who have repeated collisions, or who are at fault and are over 70 years of age, or where medical conditions are involved.

Representatives of various trucking companies and the public recom-

mended to the Commission that copies of police charges against truck drivers be sent to their employer because drivers are reluctant to report traffic violations. For example, the Ontario Trucking Association recommended that the M.T.C. should find a method of advising employers when a driver accumulates six or more demerit points while driving a commercial vehicle, or when under suspension. The O.T.A. recommended that it should be mandatory for an employer to review, at least annually, the records of his employees. If the employer does so and can prove that he has taken reasonable precautions to determine whether the employee has a valid driver's licence, then the employer should not be held liable for any sanctions by reason of the employee's driving a commercial vehicle while under suspension.

Truck owners and employers have the right to see their employees' driving records upon payment of a small fee and many do so regularly so that they may assign penalties for poor performance or dangerous practices. It was suggested to the Commission many times that the levels of fines, demerit points and periods of suspension should be more stringent for truck drivers than for motorists because of the potential danger to others from heavy trucks. The threat of suspension of a licence is a most powerful deterrent to improper driving. Not surprisingly, many truck drivers resent the suggestion of a double standard and point out that they too are motorists some of the time. It has also been suggested that a revised demerit program could be modelled after the probationary licensing system. The demerit points would be the same for the same conviction for all drivers, but truck drivers would receive warning letters, interviews and suspension at lower levels of accumulated demerits than for motorists.

The Private Motor Truck Council of Canada, in their brief to the Commission, recommended that "where a driver error is the cause of an accident, clearly the driver should be required to undergo a re-training or re-testing program before returning to the road". The Ontario Safety League recommended "that consideration be given to the requirement for every person to take a driver improvement course when such a person accumulates a certain specified number of demerit points".

Section V of the 1977 report of the Ontario Select Committee on Highway Safety dealt with the enforcement system. The Committee was frequently told by members of the public that stricter enforcement of current laws would be the most effective road safety measure but the Committee found that things were not that simple. Enforcement involves the drafting of the laws in the first place; the penalties which are provided; the activities of the police and the adjudicative processes of the courts. Too often the public thinks only of the police when they think about law enforcement. In fact, the effectiveness of the police is determined to a great extent by the fines and penalties which are awarded by the courts. Several times the Commission was told that penalties are insuf-

ficient or even trivial.

One Crown Attorney reported that it was not unusual for drivers of unfit and dangerous vehicles to ignore inspectors and the police and go back on the road at the first opportunity because they believe it to be cheaper to pay a small fine than to have the repairs completed. He said that some of the cases he had seen were nothing short of criminal negligence. In 1982 the general penalties were increased from a maximum of $100.00 to a maximum of $500.00. Whether or not this will prove to be more effective remains to be seen.

7.2.4. Trucking companies have economic incentives to discourage poor driving. Poor driving increases fuel consumption, maintenance costs and repair bills. Under the Ontario Workers' Compensation Act, a firm with a poor accident record may receive an additional billing because of a poor experience rating, but if the accident record is good, they may receive a rebate. Also, insurance companies adjust their insurance premiums on the basis of accident records.

The Private Motor Truck Council of Canada endorsed the need for pre-employment screening and the monitoring of performance. Among members of the P.M.T.C.C., 72% conduct formal safety and training programs, 65% hold regular safety meetings and 44% have formal safety committees. Almost all the members analyze accident reports and 65% conduct periodic medical examinations of their drivers. The Council recommended that drivers should be retested annually to retain a licence. Many companies insist that their drivers limit their speed, limit their hours of work, take proper rest breaks and check their vehicles regularly. The result is improved safety, lower insurance premiums and lower costs of operation.

7.2.5. Members of the O.P.P. have reported that while conducting investigations into mechanically unfit commercial vehicles, the drivers often state that they are forced by thèir employers to drive unsafe vehicles or face dismissal. Employers conversely state that the drivers fail to notify supervisors of safety defects in the vehicles. The Ontario Occupational Health and Safety Act clearly sets out procedures and responsibilities for both workers and employers for safety standards in the workplace. Recent correspondence with the Solicitor General confirms that a truck is considered a "workplace" and that the Ontario Occupational Health and Safety Act does afford truck drivers protection against pressure to operate unsafe equipment. Section 17 of the Act states:

> "A worker shall report to his employer or supervisor the absence of, or defect in, any equipment or protective device of which he is aware and which may endanger himself or another worker"
>
> "No worker shall use or operate any equipment, machine, device or thing or work in a manner that may endanger himself or any other worker"

The driver is afforded protection against dismissal or other disciplinary action by section 24 of the Act which states:

> "No employer or person acting on behalf of an employer shall
>
> (a) dismiss or threaten to dismiss a worker,
>
> (b) discipline or suspend or threaten to discipline or suspend a worker,
>
> (c) impose any penalty upon a worker; or
>
> (d) intimidate or coerce a worker,
>
> because the worker has acted in compliance with this Act or the regulations of an order made thereunder or has sought the enforcement of this Act or regulations."

The penalties for violations of this Act can be quite substantial as provided in Section 37; there may be fines up to $25,000 and twelve months imprisonment.

7.2.6. The collective bargaining agreement between the various Teamsters local unions and trucking companies provide for wage rates, reasonable driving hours and security of employment. They also address areas of employee behaviour which warrant disciplinary action such as traffic violations. For example, for the first offence, a driver may be suspended for a period usually from one day to one week; for a second offence, the duration of suspension increases or the employee may be subject to dismissal. Union recognized infractions include:

(a) tempering with tachographs, governors or other safety devices,
(b) failure to ensure that power equipment is properly serviced,
(c) failure to ensure that all tire pressures are checked before leaving the terminal,
(d) failure to secure cargo and equipment properly,
(e) failure to report mechanical defects in equipment,
(f) unauthorized use of Company motor vehicles,
(g) consuming intoxicants or illegal stimulants while on duty or on the Company's property,
(h) reporting for duty while under the influence of an intoxicant or an illegal stimulant,
(i) driving at speeds in excess of Government posted speed limits.

If the infraction is serious, such as consuming intoxicants or illegal stimulants while on duty or on the Company's property, the driver may be subject to instant dismissal. The Union often requires that records of infractions of the rules and regulations be removed from the employee's record after two years. Existing Company rules and penalties must not conflict with those contained in the collective agreement.

All penalties and reprimands must be issued to the employee within 72 hours (Saturdays, Sundays and general holidays excluded) from the time the

infraction became known, with a copy to the local union. Otherwise the penalty or reprimand will be considered null and void.

Accidents for which the employee is at fault or for which his action or lack of action is a contributory factor, will result in disciplinary action which may range from a reprimand to dismissal, according to the seriousness of the accident, the degree of negligence or carelessness and/or frequency of accidents. However, the driver will be absolved of blame if the accident is proven to be caused by mechanical failure, and then the Company will be responsible for wages and expenses if the driver involved is required to appear in court.

7.3. Enforcement

7.3.1. Enforcement of traffic regulations is by necessity a highly selective process. The types, numbers of charges laid and convictions depend on the level of enforcement, its geographical and temporal distribution and the allocation to types of violations or types of vehicles. Enforcement is largely based on subjective decisions by senior management of the police, or by the individual traffic officer. It also depends to a very great extent for its effectiveness on the visibility and creditability of the enforcement system. It is a basic precept that effective enforcement must have a deterrent effect. There was a special edition of "The O.P.P. Review" in August of 1979 which dealt with the effects of preventative policing on traffic accidents and crime. The report notes the vast areas of the Province which they must control with their limited manpower from less than 200 detachments. The O.P.P.'s field constable complement of under 3,000 monitors a jurisdiction of just under 1 million square kilometres and many thousands of kilometres of roads.

A police "visibility factor" was formulated and it was shown that the number of highway accidents decreased as the visibility factor increased. Similarly a police "contact factor" was defined and it was shown that the number of collisions decreased as the contact factor increased. A police car parked at the roadside with the officer warning or charging a driver is seen by many more drivers than if the patrol car is moving with the stream of traffic. The motorist's perception of the level of enforcement is increased. Traffic officers may have a particularly salutory effect if their visibility is high in those areas where accidents have been most frequent. According to D.J. Basham in "Traffic Law Enforcement":

> "Because of this reaction of the motoring public to an officer engaged in roadside contact with a motorist, it is desirable that officers make this contact as often as possible. It is not necessary each time a traffic officer stops a vehicle for a minor infraction that he issue a traffic citation. Often an officer may be engaged in notifying a motorist of a non-hazardous defect in his utomotive equipment. The officer may also be engaged in giving directions. The purpose of the stop is now known to those motorists who are driving past. It is often the automatic assumption by observing motorists that the officer is issuing a traffic citation. Therefore, armed with this information, a traffic officer who makes frequent contact with motorists at the roadside is creating a 'halo effect' on the traffic in his immediate vicinity and is accomplishing his mission, to have a positive effect on traffic safety."

Increased police presence and enforcement has proven to be effective in numerous experiments. During the period from October 5, 1981 through December 5, 1981, a saturation patrol was conducted on Highway 7, over a 33 km. section between Woodbridge and Markham. After studying traffic density and flow charts, O.P.P. traffic officers were strategically deployed. Staff resources were increased from two to five patrol cars manned by a total of thirty officers around the clock. A mobile trailer equipped with a breathalizer and three radar sets was used as a base. The number of impaired drivers arrested increased by 71%. The results were very positive showing an 18% overall decrease in the projected number of accidents. Furthermore, after December 5, 1981, when the traffic officers returned to duties in other areas, a further three month study without enhanced police presence indicated that the accident rate rose sharply to the norm established in the previous year. O.P.P. Commissioner Erskine noted that the severity of personal injury accidents appeared to have been reduced and he attributed this to reduced speeds in response to the visibility of the police presence.

7.3.2. This Commissioner met with the O.P.P. Traffic Sergeants at their annual seminar in March 1982. They are each responsible for enforcing the traffic laws and highway safety in their own district. It was felt by some of them that traffic duty is perceived to be of lesser priority than other more appealing areas of career development. Traffic law enforcement is often unpopular with the public and sometimes with the police themselves. The police officer is virtually never criticized for arresting criminals, yet he is met frequently with hostility when he apprehends a traffic violator. It is apparent that most people think that the proverbial 'other person' gets involved in traffic accidents or charged with traffic violations. The 'it won't happen to me' syndrome prevails in the public perception of traffic risk. This syndrome has a sociological explanation in that the public and the police place different values on traffic enforcement. While the public and the police both share the same values with regard to violent crimes, placing much emphasis upon apprehending and punishing criminals, the police tend to place a higher value than most of the general public on apprehending traffic violators.

In most criminal cases, it is incumbent on the prosecutor to prove that the accused committed a particular crime on purpose, having "mens rea" a guilty mind. In traffic prosecution, however, the prosecutor need only prove that the accused committed a violation; he need not prove mens rea . Many people charged with committing a traffic violation feel that they are not guilty because they "didn't do it on purpose".

It would appear that a double standard is practised by the motoring public regarding highway safety. While most people claim that they are in favour of highway safety, those same people do not improve their driving habits and sometimes react with anger when caught committing a traffic violation. It is not uncommon

for a police officer to be operating radar on a specific street as a result of public complaints regarding speeders, and apprehend one or more of the actual complainants for speeding violations. Safety begins "at home" with the driver.

Several motorists have suggested to the Commission that traffic police are unlikely to stop larger trucks committing traffic infractions. This is felt to be particularly so on expressways and is attributed to:

(a) Stopping large vehicles such as trucks, especially on high speed highways is often difficult. In order not to jeopardize the safety of other road users, an officer may be forced to let the truck go.

(b) A bond may exist between truck drivers and police officers who share the roads both during the day and at night. The officer may therefore be less inclined to stop truckers for some types of violations.

(c) Large trucks are more complicated mechanical units than cars. Officers may attribute certain driver actions to the vehicle's operational characteristics.

The Ontario M.T.C. accident data file shows that for 1981, 70% of the passenger car drivers judged not to be driving properly at the time of the accident were charged by police, but only 56% of the straight and articulated truck drivers similarly judged not to be driving properly were charged.

7.3.3. The 1974 DelCan speed study conducted for the Canadian Federal Ministry of Transport states that speed control methods can be classified into three categories:

(1) Posted legal limits, either maximum or minimum with corresponding law enforcement activities to make sure that the limits are observed.

(2) Engineering related methods, e.g. changeable message signs, rumble strips, on-board vehicle warning systems.

(3) Educational techniques such as driver education programs and public safety campaigns.

The Ontario H.S.A., Section 109 prescribes fines for persons exceeding the speed limits. On convictions, such persons are liable to the following:

(a) $1.25 for each km./hour for an offence less than 20 km/hour over the limit,

(b) $1.75 for each km./hour for an offence between 20 and 39 km/hour over the limit,

(c) $2.50 for each km./hour for an offence between 40 and 59 km/hour over the limit,

(d) $3,25 for each km./hour for an offence of 60 km/hour over the limit or more.

These are really not very heavy penalties considering the extent to which speeding

causes serious accidents. However a court convicting any person of exceeding the speed limit by 50 or more km./hour may suspend that person's driver's licence for a period of not more than thirty days.

The Ontario 'Demerit Point Sustem' (see section 7.2.3.) also imposes penalties on persons convicted of speeding infractions, as follows:

(a) 3 demerit points for exceeding the speed limit by 16 to 29 km./h.
(b) 4 demerit points for exceeding the speed limit by 30 to 49 km./h.
(c) 6 demerit points for exceeding the speed limit 50 km./h. or more.

Complaints regarding truck behaviour, especially speeding, are routinely received by the O.P.P. Traffic Division. In response to these complaints, a speed study was conducted during July 1980 in conjunction with the Ontario M.T.C. The study was carried out in central Ontario on major highways with a posted speed limit of 100 km./h. The results of this study indicated that the trucks had a compliance rate of 86% with the 85th percentile at 99 km./h. Studies in the same area showed total vehicle compliance to be only 49% with the 85th percentile at 108 km./h.

It is not uncommon for witnesses of an accident to state that a large truck was travelling at high speed before collision, while the truck driver stated he was travelling at less than the posted limit. On many occasions where the truck in question is equipped with a tachograph, it is proven that the truck indeed was not speeding.

Many people might drive 200 km. and have several hundred cars exceeding the speed limit pass them and think little about it. However, if one truck passes their attention will likely be drawn to the truck.

Hauer et al (1980) in an Ontario speed enforcement study: Speed Enforcement and Speed Choice, sponsored by Transport Canada, examined the relation between speed enforcement and driver speed choice. The study notes that the safety effect of speed enforcement is not clear despite decades of enquiry. The authors judged the findings of previous speed enforcement studies to be of little use because of their contradictory nature and scientific shortcomings. However, it is generally agreed that accident severity increases with deviation from median speed, i.e. from "the pace".

Speed enforcement influences speed choice in three ways:
(a) Drivers detected and apprehended may alter their driving behaviour,
(b) Drivers exposed to enforcement activity, although not contacted, may choose to modify their speed near the enforcement site,
(c) Drivers form opinions concerning risk of detection.

The "distance halo" effect is the extent of the immediate effect of an enforcement symbol upstream and downstream from their location. The magnitude of the reaction

within the distance halo has been reported by different investigators ranging from 0 to 20% reductions in average speed. The distance halo is estimated to be approximately 5 miles in either direction from the enforcement point. The "time halo" effect is the effect of exposure to enforcement on driver speed choice, near the enforcement site on subsequent occasions. The time halo effect has been estimated to last as long as 10 days, depending on the enforcement method used.

7.3.4. As with excessive speed, driving while under the influence of alcohol is an offence which draws a large concentration of enforcement resources. Because of the importance of alcohol as an accident cause, especially in severe personal injury or fatal collision, society expects the police to devote great effort to the detection and apprehension of drunk drivers. Police forces and other government organizations are constantly involved in the implementation of strategies designed to search out drunk drivers. For example, many police forces set up roadside spot checks during the Christmas season primarily to check for drunk drivers. The RIDE program of the Metropolitan Toronto Police is one such example. Much like the radar, the advent of the breathalyzer technology has led to a more objective processing of violators.

Alcohol related traffic violations fall under the Criminal Code of Canada. In 1981, over 22,000 drivers in Ontario were convicted of having more than 80 mgm. of alcohol in the blood stream; over 21,000 drivers for driving while in an impaired condition, and 3450 drivers for refusing to take a breathalyzer test. Charges were laid against over 5,000 straight truck drivers and 120 drivers of tractors with semi-trailers for either driving while impaired or having over 80 mgm. blood alcohol content!

7.3.5. Unlike speed surveillance, which has been developed into a relatively efficient and objective procedure by virtue of radar technology, the detection and apprehension of drivers who tailgate or lane-hop is much more difficult as there are no technological aids presently available. Whereas violation of speed limits tends to be of lengthy duration (e.g. a driver exceeding speed limits for the entire duration of a four-hour trip), violations such as tailgaiting, unsafe lane changes or improper passing manoeuvers tend to be of short duration. Therefore, while long-lasting infractions such as speeding can be efficiently detected by a single radar unit parked at a roadside location, other moving violations can only be detected if patrol cars happen to be travelling in the traffic stream at the right time and place. Given the scarcity of traffic patrols relative to traffic volumes and distances, the probability of detection is remote, unless the manoeuver results in an accident. Note that trucks travelling in prohibited left hand lanes of expressways is generally not short term and could be as efficiently controlled as is speeding. Another factor which impedes detection is the fact that drivers tend to be on their best behaviour in the vicinity of

a police cruiser.

Tailgaiting is most prevalent in congested traffic when it becomes difficult to maintain proper following distance. Truck drivers told the Commission that attempting to maintain following distance only resulted in another vehicle moving into the space created. This happens very frequently on expressways such as the Queen Elizabeth Way and Highways 400 and 401.

Regardless of infraction type, enforcement of regulations for drivers of large trucks is hampered by the widespread use of citizen's band (C.B.) radio. Almost instantaneously, information pertaining to the nature and location of traffic law enforcement units or government inspection units passes for miles up and down the highway. Armed with this knowledge, truck drivers who may have been committing moving violations such as tailgaiting or speeding, revert to good behaviour, at least until the risk of detection has passed. Roadside spot-check units can often be bypassed by violators who wish to avoid the risk of detection.

7.3.6. Section 50 of the Ontario H.T.A. requires every bus when driven on a highway to be equipped with a speedometer which must be maintained in good working order, but there is no similar provision for trucks. The O.P.P. Traffic Sergeants raised the issue of the lack of a requirement for trucks at their 1982 annual seminar. There was some concern about how truck drivers could judge the speed of their vehicles accurately without a speedometer. There is no Canadian Federal motor vehicle safety standard explicitly requiring that new or imported motor vehicles be equipped with speedometers. However, the Commission polled representatives of the motor vehicle manufacturing industry and it was reported that the industry makes speedometers and odometers standard equipment on all new vehicles, including large trucks. It was felt by some in the industry that tachometers can effectively replace speedometers so some truck owners may remove the vehicle's speedometer if they have installed tachometers.

7.3.7. There are three methods of recording drivers' hours of work: the use of log books, supplementary trip records and tachographs. Prior to April 1982, the Canada Labour Code required every interprovincial motor carrier operator to keep a daily log of total hours travelled, routes travelled and stops. Over 60,000 drivers were required to keep their log books available for inspection for 13 months. The federal government dropped the requirement because the log books were not being inspected and there was a huge paper burden. Now the Canada Labour Code requires that similar information be kept for inspection only at home terminals, but carriers may continue to use daily logs if they so wish. Labour Canada has issued a fourteen point set of guidelines for Supplementary Driver Records to replace the log books, which include details about the carrier and vehicle; time and place of departure and arrival; hours of rest before and during

a workshift and the number of hours and miles spent actually driving.

The Teamsters Joint Council, the O.T.A., the O.P.P. and a number of independent drivers told the Commission that log books were often inaccurate, easily duplicated or falsified, and often not kept at all. Most companies keep daily trip sheets so in the future, Labour Canada inspectors will use these and concentrate on terminal inspections. This will result in cost savings but may not change the temptation to falsify the records, so the fines were increased to up to $5,000 or one year in prison upon conviction. Labour Canada has proposed that the penalties be increased further to a maximum of $35,000 or five years in prison.

The Teamsters Union was not opposed to using log books and suggested that they could be issued bearing the truck drivers' licence to avoid duplication. The Teamsters believe that the penalties for violating hours of service regulations are not severe enough and that possible suspension of operating authority would be more effective.

7.3.8. Tachographs are mechanical or electronic recording devices which are placed in the cab of a truck and connected so as to record the time and the performance of the truck. The vehicle speed and distance travelled are recorded on a chart so that the number and duration of stops is easily seen. The most sophisticated instruments also record engine revolutions per minute, engine temperature, brake use and oil and water levels. The complete history of a trip can be deciphered from a tachograph by an experienced reater, as well as obvious things like speeding. They have been used for many years all over the world and are mandatory for heavy trucks in over twenty countries. The use of tachographs is already extensive in Ontario and their use was recommended to the Commission by many agencies including the O.T.A. and the Teamsters Joint Council. The chart is inserted, removed and signed by the drivers. It can be used to control vehicle operation for maximum economic benefit as well as for monitoring violations of the speed laws and hours of work regulation. According to the O.P.P. the charts have been accepted by courts as evidence for prosecution or defence in numerous trials. From the standpoint of accident investigation, tachographs are invaluable in determining how an accident actually occurred, much the same as a flight recorder in an aircraft.

Many companies report that tachographs are invaluable management tools that assist in determining drivers' pay, in billing customers, as well as in fuel savings and in vehicle maintenance. However, the installation of a tachograph may cost up to $1500 and some companies have had unfortunate experiences because of lack of cooperation from drivers who resent the "Orwellian Big Brother" implications of a machine constantly monitoring their performance. Some people claim that a tachograph can be tampered with but this should be easy to prevent

or identify. Other objections are that they are not cost effective, that expert analysts are needed, and that it would be difficult to enforce their use for out-of-province trucks, also that there is little evidence that safety would be improved. Small companies with small trucks, like local cartage firms, feel that they see their drivers frequently enough that tachographs are an unwarranted expense.

7.3.9. Traffic surveillance and control has traditionally been conducted by enforcement officials in patrol cars, motorcycles or airplanes, or by M.T.C. inspectors on the highway or at M.T.C. vehicle inspection stations (weigh scales). Generally, traffic surveillance depends on visual inspection and selective sampling because there are not enough enforcement officials to implement continual traffic surveillance in any one area. But it has been proposed that as technology develops, in the future it may be possible to identify electronically, vehicles and drivers committing traffic offences. A system to detect and photograph speeding vehicles has been in place on certain segments of highways in Germany for several years. These systems include closed circuit television cameras mounted on poles, ramp metering devices and detectors buried in the pavement feeding information into computers at a central control location. Traffic control specialists monitor the traffic congestion, speed and any accidents. Emergency medical, police or maintenance personnel can be dispatched to the freeway incident very quickly after detection and changeable overhead electronic signs can warn oncoming motorists. Infra-red detectors allow photographs even in the dark, and several ramps now include traffic lights which may be controlled by the computer. In the future, it may be possible to detect and determine the nature of a variety of traffic infringements including speeding, following too close, overweight, etc. Such information could be provided to a central computer including the date, time, location and nature of the offence, and the computer could print and mail warnings or tickets. Alternatively it could alert the nearest police or highway official giving the offender's licence number for identification and apprehension.

The Select Committee on Highway Safety in 1977, recognized the potential value of such remote surveillance systems and noted that the detection equipment, if made highly visible, acts as an effective deterrent. The Committee recommended that:

> "The Government of Ontario should install remote radar controlled speed measuring cameras and dummy cameras on dangerous stretches of road" .

Because the Ontario Highway Traffic Act would require changing, the Committee also recommended that:

> "The Government of Ontario should enact legislation allowing the registered owner of a vehicle to be ticketed for specific offences when identified by the highly visible remote cameras".

7.3.10. Dedicated traffic enforcement patrols have been initiated in several jurisdictions in North America. The New Brunswick Highway Patrol (N.B.H.P.) began operating on the Trans Canada Highway in New Brunswick in 1980. It is Canada's first highway patrol, dedicated strictly to traffic law enforcement. Most of the officers have previous police experience and all undergo a retraining course at the Atlantic Police Academy. By early 1982 the N.B.H.P. had a complement of 30 uniformed peace officers and an impressive radio communications system. Under the N.B. Police Act, the N.B.H.P. is defined as a police force with investigation and arrest powers anywhere in New Brunswick.

The N.B.H.P. has been credited with causing a reduction in traffic deaths on the highway section under its jurisdiction (from 33 in 1979 to 22 in 1980 and 14 in 1981). The N.B.H.P. deploys five specialized commercial vehicle enforcement officers, located throughout the province, who concentrate their activities on commercial vehicle traffic. According to the N.B.H.P. brochure, the style of policing operated by the Highway Patrol results in a very high portion of time being spent on actual road patrol. It is felt that this results in a greatly enhanced police presence in the area concerned and acts as a strong deterrent to the commission of offences within the Patrol's area. Patrol activities are scheduled so that intensive patrol efforts are carried out during peak accident periods. Other areas of New Brunswick have expressed interest in the N.B.H.P. service. Commercial vehicle violators are known to bypass the stretch of highway patrolled by the N.B.H.P. because of the higher relative risk of detection and apprehension.

The O.P.P. currently employs Selective Law Enforcement Patrols (SLEP) which involves the on-road monitoring of all vehicle types, including trucks, with the aim of helping to reduce accidents. The S.L.E.P. officers operate in a plain vehicle with the O.P.P. emblem on the doors. The officers are selected on the basis of the interest they have shown in this field of police activity. As part of regular detachment planning, a S.L.E.P. unit is sent out to patrol selected areas, with an aim to search out potential accident-causing violators (e.g. a truck with an unstable load) at high risk locations. The S.L.E.P. vehicles are located throughout the province at each O.P.P. district. They are rotated among the various detachments, although the larger detachments such as Downsview permanently have S.L.E.P. units on hand.

O.P.P. personnel rate the S.L.E.P. program as useful in helping to achieve overall reductions in accidents. The Downsview S.L.E.P. units operate daily. Trucking of hazardous materials across Toronto (401) is a major area of S.L.E.P. concentration.

7.3.11. According to the O.T.A., most illegal trucking is conducted under the mask of private trucking. This was made clear during testimony before the Select

Committee on Highway Transportation of Goods in 1977. Confusing arrangements are being used by carriers and shippers to avoid the requirement of obtaining proper operating authority. These illegal activities include the use of phony leases, bills of sale, silent indemnity agreements and artificial T4 slips. It has been shown that an illegal trucking service can be made to appear legal simply by painting a shipper's name on the side of a vehicle. This in itself makes the shipper/carrier relationship difficult to trace.

The existing fines of the Public Commercial Vehicles Act provide only a small economic disincentive to shippers and carriers who operate illegal trucking services. Minimum fines of $250 for a first offence if detected and apprehended and $500 for a subsequent offence in a 5 year period can be seen as a risk worth taking. Many legitimate P.C.V. carriers, on the other hand, have spent tens of thousands of dollars to legally secure operating authority before the O.H.T.B. under the terms of public necessity and convenience stipulated in the P.C.V. Act. Enforcement staff of the M.T.C. face an almost impossible job of trying to untangle the trail of paperwork that is used to disguise illegal trucking. Since these operators have successfully managed to flaunt the basic regulations affecting commercial motor vehicles, there is a high likelihood they also disobey or ignore other laws relating to safety standards of their vehicles and drivers.

The O.T.A. stresses that any enforcement program must be viewed as part of a total system. The O.T.A. utilizes on-highway surveillance techniques to identify flagrant violators. A reporting procedure undertaken as part of this surveillance program also provides information to an off-highway investigation process.

To increase the government's overall ability to trace those carriers who attempt to defeat enforcement systems, the O.T.A. proposes that the M.T.C. create a new licence which would authorize a company or an individual to operate commercial motor vehicles. This licence, which the O.T.A. propose to call a Vehicle Operator's Licence (V.O.L.) currently is used by several countries. It would consist of a registration certificate maintained by the Ministry and the applicant, with sufficient similarly numbered registration plates to license all of the vehicles operated by each separate applicant. Once in possession of a V.O.L. number, the beneficial owner of any subsequent transportation service could register vehicles uneer the H.T.A. Thus, each commercial motor vehicle in the province, whether public or private carrier, would bear a plate which could readily be traced to the company holding authority to operate the vehicle at any given time. The ultimate sanction for flagrant or repeated violation of safety, maintenance or operating laws attached to the industry would be suspension or cancellation of a V.O.L. Therefore, companies showing a poor operating or safety record would risk losing the right to operate commercial motor vehicles.

It is essential to this system that the M.T.C. and all operators of commercial motor vehicles have and understand a clear and concise definition of a vehicle operator. Within this new licensing system, the O.T.A. recommends the following definition in the appropriate section of the Ontario H.T.A.:

> "A vehicle operator will be any individual, firm or corporation who owns, leases, or otherwise acquires the use of a commercial motor vehicle for the purpose of transporting goods, whether or not such service is conducted for compensation or otherwise".

This V.O.L. should be made available at a minimum registration fee covering costs to issue the registration certificates and accompanying plates. The O.T.A. proposes that operators be able to register vehicles only under the name of the beneficial owner of the vehicles being licensed. With the exception of financial lease agreements, this will assist the identification process and could result in cross-referencing to monitor safety records of subsidiary companies.

The V.O.L. would become the major co-ordinating tool in this enforcement system. It would provide a ready identification for all vehicles and their beneficial owners. It would also serve as a reference tool to support off-highway investigations.

The sole exemption contemplated from the requirement to hold a V.O.L. is for private individuals who rent a truck to move their own used household effects. This exemption would acknowledge the growing number of people making use of rental services in order to move economically to a new home.

The Hamilton Automobile Club's submission recommended that "O.T.A.'s concept of a Vehicle Operator's Licence (V.O.L.) is worthy of pursuit". The Teamsters' final submission stated that the V.O.L. concept proposed by the O.T.A. is essentially sound, and that if the V.O.L. licence could be made subject to cancellation for violators of hours of work laws, the entire safety picture in Ontario would be considerably enhanced. The Teamsters supported the Vehicle Operator Licence concept proposed by the O.T.A. and recommended that the proposal be adopted.

7.4. Incentives

7.4.1. Safe drivers need to be recognized! The success of an awards program depends in part on how highly regarded the awards are by the drivers and how attainable the company's goals are. The rules and conditions should be understood prior to beginning the program and they must be uniformly applied. The incentives may vary all the way from a "pat on the back" to recognition in newsletters and the presentation of safe driving pins at banquets. Some organizations give cash bonuses, savings bonds, merchandise, or paid vacations. At least one company gives a share in the company. The presentations are usually made in public so that the driver can receive recognition from his fellow drivers.

The provincial trucking associations conduct truck rodeos where the events are designed to test the skill required to manoeuver the vehicles, and champions are selected on the basis of field tests, inspection tests and knowledge tests. To qualify for the rodeo, drivers must have driven for a period of twelve consecutive months without a preventable accident. The provincial rodeo committees recommend entrants for the National Truck Rodeo conducted by the Canadian Trucking Association. The Provincial and National Champions are honoured and presented with awards after the competition. Mack Canada sponsors a national driver of the year award which usually goes to an individual with many years and millions of miles of accident-free driving.

The Ontario Transportation Safety Association conducts annual safe driving award banquets across the province. Persons who operate a commercial motor vehicle for 75% of their working time are eligible but there is a three-year proving period. There are three categories of safe driving awards:

(i) bronze, for up to four years
(ii) silver, for five to nine years
(iii) gold, for ten years or more

Insurance companies could provide an incentive to trucking companies to introduce good safety practices like those of the Ontario Safety League, by reducing insurance premiums at the time the program is introduced rather than after the fact. At present a company must prove a reduction in accidents resulting from their program before they benefit.

Most trucking companies base their incentive programs upon whether or not their driver was at fault in a personal injury accident. Often a non-preventable accident is considered to be one involving a driver who did everything reasonably possible to prevent the accident. The determination of driver fault in an accident is normally done by the safety supervisor or a committee of management personnel.

Motor carriers who have introduced fuel economy programs have increased

both fuel efficiency and their safety records significantly. It is felt that drivers may be more committed to a program if it has more direct economic benefits such as the driver receiving a rebate on fuel savings. Companies can more easily measure driver's fuel usage than his safety performance. It is felt that by motivating drivers to conserve fuel, there may be an overall improvement in safety performance as well. It is important that the fuel consumption baselines set by the company are realistic and accepted as such by the drivers.

7.4.2. Innovative anti-speeding programs involving use of roadside signs have proven to be great incentives in reducing the incidence of excessive speeding. Dr. Ron Van Houghton of Mt. Saint Vincent University is the architect of a program designed to reduce speeding by displaying speed behaviour on the adjacent roadway. It is a form of positive reinforcement, and has successfully been implemented in Dartmouth, Nova Scotia. By making drivers aware of their behaviour, they tend to reduce speed. The eleven signs in the Dartmouth area have reportedly led to a 40% reduction in road accidents and a 50% reduction in speeding offences. The success of this program is based on driver participation and shows that incentives may be more effective than sanctions.

Another roadside sign program has been undertaken north of Elliot Lake, Ontario, on Highway 108. Several wordings have been adopted, all containing the initials W.E. which stand for "Watchful Eyes". For example, one sign states "W.E. ARE WATCHING YOU!" According to Maurice Macknight, who conceived the program, the signs serve to remind drivers of the dangers of speeding and unsafe passing, and are intended to be changed frequently to maintain attention. The program has received support from local groups including the O.P.P. for its innovation and effectiveness.

7.5. THE COMMISSION RECOMMENDS THAT:

1. The M.T.C. should undertake an information program aimed at the motoring public explaining how trucks operate and how best to share the road with them safely. The M.T.C. should make use of roadside signs like the "Watchful Eyes" program on Highway 108.

2. All candidates for a Class D or Class A licence should be required to complete a first aid course equivalent to that provided for the St. John Ambulance Emergency First Aid Certificate, and all buses and heavy trucks should be required to carry a first aid box as set out in the Workers Compensation Act.

3. The M.T.C. should investigate the possibility of extending the probationary licence system to include the demerit point system, and determine the point levels at which truck drivers should be put on probation or have their licences suspended.

4. The Government of Ontario should require all motor vehicles to be equipped with a speedometer clearly visible to the driver.

5. The M.T.C. should establish the minimum specifications for tachographs which should then be made mandatory in all commercial vehicles exceeding 14,500 kgms. registered gross weight.

6. The fines and demerit points for speeding should be increased substantially and the speed above which a driver may be suspended should be lowered.

7. The O.P.P. should continue its program of saturation patrols and the Government of Ontario should provide the O.P.P. with the resources necessary to increase the number of its Selective Law Enforcement Patrols.

8. The Government of Ontario should amend the Highway Traffic Act to allow the prosecution of the operator of a commercial vehicle for traffic offences when detected and identified by remote surveillance systems.

9. The Government of Ontario should accept the recommendation of the O.T.A. that a new commercial vehicle operator's licence be established whereby every operator of a commercial motor vehicle may be held accountable for the performance of the drivers, the mechanical fitness of the vehicles used and the hours of work regulation

10. The Ontario Ministry of Labour should expedite its program to enforce the requirements of the Occupational Health and Safety Act in the trucking industry.

CHAPTER VIII PERCEPTIONS AND EXPECTATIONS

8.1. Public Perceptions

8.1.1. As was pointed out in Chapter I, the public apparently perceive trucks, especially large trucks, as a menace on the roads and highways, at least according to the news media and the Ontario Motor League. The Commission set out to try to establish the degree to which this is supported by fact by observing the participation at our public hearings; analyzing the nature and origin of letters; reading newspaper reports, coroner's inquest reports, and trade magazines; and by conducting an independent public opinion survey designed and controlled by experts.

No attendance records were kept at public hearings but it varied from as few as ten on Friday evening in Sudbury to over one hundred in Toronto. Attendance was high in Hamilton and Windsor, moderate in Kingston, Ottawa, London and Thunder Bay. Participation was most regular by representatives of vested interest like the Ontario Motor League, the Hamilton Automobile Club, the Ontario Trucking Association, the Ontario Provincial Police and the Ministry of Transportation and Communications. Only occasionally did private citizens or ordinary truck drivers make statements at the public hearings, and this is probably because it takes a good deal of courage and ability to express controversial views in a public formal. However, those who did, were articulate and confirmed very well the views that the Commission received by mail. The interesr shown at public hearings correlated well with the geographic distribution of serious motor vehicle accidents as set out in 1981 Ontario Motor Vehicle Accident Facts.

TABLE XVIII

1981 MOTOR VEHICLE ACCIDENTS

Place	Fatal Accidents	Total Accidents
Toronto	90	46,478
Ottawa	12	8,062
Hamilton	22	6,952
London	9	5,371
Mississauga	17	5,661
Windsor	13	4,553
Thunder Bay	11	2,900
Sudbury	10	2,222

8.1.2. The Commissioner received directly approximately two hundred letters plus about two hundred more which were sent to the Minister and forwarded to the Commission. Approximately 30% came from the Metropolitan Toronto area. There was a very strong correlation with the routes of Highways 400 and 401. About

72 came from the Hamilton area and about 8% from the Mississauga-Burlington route, and about 3% from Orillia, Barrie, North Bay and Sault Ste. Marie. Over 70% originated along the route from Oshawa to Niagara Falls and only 6% were from Northern Ontario. The vast majority were highly critical of trucks and truckers and complained vigorously about their huge size, speeding and tail-gaiting. The few truck drivers who wrote complained about foolish motorists who deliberately cut in front of a truck or drove too slowly. There is no doubt that truck drivers feel frustrated and motorists feel intimidated.

8.1.3. Accident reporting in the Canadian daily press was investigated by Wilde and Ackersville in a report to Transport Canada entitled: Accident Journalism and Traffic Safety Education, 1981. Traffic accident reporting was investigated on three levels: a content analysis, a readership analysis and a field experiment of a modified accident reporting style.

First, twelve daily newspapers in Ontario and Quebec were investigated as to the manner in which they reported traffic accidents, over a three-month period. The accident reports were analyzed in terms of about 50 variables and compared with accident data obtained from police departments and provincial Ministries of Transport. Very small percentages of actually occurring accidents were found to be reported by newspapers, which also contained little information on the causes of these accidents. The variables that received the highest rate of mention included: the number of vehicles involved in the collision; the date, time and location of the accident; the occurrence of injuries and fatalities; and the driver's name and address. Vehicle make and manufacturing year were rarely mentioned and trucks were not specifically identified.

Secondly, semi-structured telephone interviews were held with 392 holders of valid driver's licences in Kingston, Ontario. The interviews focussed upon motivations and reactions to the reading of traffic accident reports in the daily newspaper. The data were analyzed with a view to providing information of potential use in the development of an accident reporting style which would better inform and educate the road-using public with respect to the size of accident problems, their causes and their preventability.

Thirdly, an effort was made to develop a prototype of a more educational accident journalism. The modified style was implemented by the daily newspaper in Kingston while another community, Belleville, served as control. Social surveys conducted before and after the eight-week implementation of a modified style took the form of telephone interviews with a total of approximately 1200 licensed drivers. Significant changes were observed in people's opinions of accident reporting, in their perceptions of the magnitude of the problem and traffic accident risk, and in the attribution of accident causes.

From these findings, it seemed reasonable for Wilde to conclude that

the state of affairs in accident reporting by daily newspapers is not optimal from the point of view of informing and educating the Canadian public with respect to the size and nature of the traffic accident problem.

8.2. Public Opinion Survey

8.2.1. There is a commonly held perception that public and media concern with the safety of truck operations in Ontario has increased in recent years but there is a very wide spectrum of views as to the causes of accidents. However, their relative importance in the eyes of the public has not been well established, so a public opinion survey of Ontario road users was undertaken in April 1982 by staff members of the Commission. The study examined the safety perceptions and expectations of truck and car drivers, and was intended to supplement opinions received by the Commission at public hearings and through the mail. D.J. Hieatt and Associates designed the survey.

A three-page mail-back questionnaire was prepared, pilot-tested and modified. The survey asked both car and truck drivers to evaluate the following:

(a) drivers' general ability to handle their vehicles properly, their driving habits and level of courtesy,
(b) the most dangerous and the safest aspects of trucks or the way they are driven.
(c) truck-car safety improvement suggestions,
(d) demographic information about the respondents.

In general, mail-back questionnaires of this type are completed and returned strictly on a voluntary basis, so the response is limited to the special sample of interested people. This limits the reliability of inferences about the perceptions of the total population. The survey was distributed to 7,500 Ontario Class 'A', 'D' and 'G' drivers. A total of 3,790 truck driver questionnaires were distributed throughout the province as follows:

(a) 1,600 surveys were mailed to a randomly selected sample of Ontario Class A licensed drivers.
(b) 1,500 surveys were mailed to randomly selected sample of Ontario Class D licensed drivers.
(c) 300 surveys were distributed by the Ontario Trucking Association to truck drivers of member companies.
(d) 240 surveys were mailed directly to 17 companies for distribution to their truck drivers.
(e) 150 surveys were distributed by the Teamsters Union Local 938 to member truck drivers.

In total, 3,750 car drivers were surveyed throughout the province as follows:

(a) 3,450 surveys were mailed to a randomly selected sample of Class G licensed drivers.
(b) 300 surveys were distributed by the Ontario Motor League to member car drivers.

In addition, the Hamilton Automobile Club independently reproduced and mailed 5,000 copies of the car driver questionnaire to their members. The Hamilton Club data were not included in our survey to avoid the possibility of over-representation of a specific geographical area. However, the H.A.C. analysis of a sample of the 2,200 surveys returned is included in Appendix B of the final report. The questionnaires were mailed in April and May 1982, the completed surveys were received during June and July, and the responses were coded numerically for subsequent computer analysis during the summer. The truck driver survey considered only those respondents who reported driving heavy articulated or straight trucks, and lighter vehicles such as pick-ups and vans were excluded from the analysis. Similarly, only respondents who reported driving passenger cars or station wagons were included in the car driver survey.

Except for the open-ended questions, the addition of qualifying statements by the respondent, or circling of more than one answer were treated as invalid, and responses to open-ended questions which clearly did not address the question were eliminated. The number of valid responses varied between questions so for this reason, subpopulations may not sum to the total number of responses in the group. One out of four truck drivers and one out of five car driver respondents held "no opinion" or felt "nothing was dangerous or irritating" about trucks or the way they are driven. All comments received were assigned to one of 80 categories and the categories were aggregated into 22 classes. The classes were combined into four broad groupings as shown in Table XIX.

8.2.2. A total of 2140, or 28% of the truck safety opinion surveys distributed were completed and returned which is quite a high response and indicates a high level of interest. Completed surveys were received from all geographical areas in Ontario but, as expected, the largest proportion of surveys was returned from areas with the greatest number of licensed drivers.

(a) Truck Driver Respondents.

Of 3,790 truck driver questionnaires distributed, 1030 or 27% were returned. Of these 900 were completed by working drivers. The truck driver respondents can be described as follows:

80% were company employed drivers
20% were owner operators
45% drove for a trucking company
45% drove for a company whose main business is not trucking
10% drove for some other agency or group
35% drove articulated trucks mainly
39% drove straight trucks mainly
6% drove both articulated and straight trucks.

(b) Car Driver Respondents.

Of 3,750 car driver surveys distributed, 1,110 questionnaires or 30% were returned. Of these, 944 or 89% of the surveys were completed by car drivers, 9% by drivers of pick-ups and vans, and 2% by drivers of other vehicles. The car driver respondents reported driving the following vehicle sizes:

24% drove small cars
51% drove medium sized cars
25% drove large cars.

There was little difference in the amount of night time driving reported by car and truck drivers. Truck drivers reported driving slightly more at night than car drivers, 11% to 3% respectively. In comparison with car drivers, truck drivers reported driving annually on average 2.6 times more kilometres on local roads, 5.5 times more kilometres on highways and 4.1 times more kilometres in total

8.2.3 The study's main findings are summarized in Tables XIX and XX and a detailed description is provided in the report entitled: Truck Safety Perceptions and Expectations, 1982 by G. Beatty and F. D'Onofrio.

TABLE XIX

	Percentage of Responses	
	From Truck Drivers	From Car Drivers
Driver Related	75%	76%
Vehicle Related	22	20
Environment Related	3	4
Other	1	0

We see that approximately three quarters of all comments received were driver related and there was little difference between car and truck driver responses at this level of aggregation. This is a remarkably close correlation with the accident data so we conclude that the public perception is sound.

TABLE XX

Dangerous or Irritating Aspects of Trucks

Percentage of Responses

	Truck Drivers	%	Car Drivers	%
1.	Following Distance	22	Excessive Speed	19
2.	Excessive Speed	19	Following Distance	18
3.	Operating Characteristics	10	Lane Usage	12
4.	Lane Usage	6	General Behaviour	11
5.	Driver Attitudes	5	Passing Behaviour	7
6.	Driver Physical Condition	5	Operating Characteristics	6
7.	General Behaviour	5	Vehicle Dimensions	6
8.	Driver Skill, Experience, Training	4	Driver Attitudes	4
9.	Vehicle Dimensions	4	Vehicle Loads	4
10.	Driver Age	3	Vehicle Types	3

Both groups of drivers cited excessive speeds and following too close as the two most common complaints. In fact, speed and following distance account for roughly 40% of the total comments made. Other major concerns cited by both groups include vehicle operating characteristics and lane usage and, although cited less frequently, driver attitudes, general behaviour, and vehicle dimensions were also common to both groups. Both groups ranked truck drivers more favourably than car drivers in terms of their skills or ability to handle their vehicle properly, safe driving habits and level of courtesy. In general, the skill or ability of both groups were perceived more favourably than their level of courtesy.

Motorists most frequently suggested travel restrictions as a means of improving safety, by segregating trucks on to truck routes or by restricting the times they may operate during rush hours and on weekends.

Truck drivers most frequently suggested that safety could be improved by educating motorists about the limitations of trucks in manoeuvering and stopping. They also recommended better education and training for truck drivers, better maintenance programs and better implementation of truck inspection programs by government, which was a little surprising.

Suggestions from both groups relating to enforcement of the laws amounted to only 12% of the total and, quite unexpectedly, the issue of driver impairment due to alcohol or drugs, did not receive much attention from either motorists or truck drivers.

8.2.4. The effective implementation of speed limits depends to a very great extent on their acceptability to drivers and whether or not drivers perceive them to be fair and reasonable. So the M.T.C. has conducted a number of Gallup polls in recent years (see Gallup Ontario Omnibus Study - Summary Report 1982). This report covers two studies, one in February 1979 and another in February 1982. Both studies sampled approximately 1000 licensed drivers through personal interviews. In both surveys, more than 75% of respondents expressed satisfaction with the present 100 km./hr. limit on expressways and only 5% thought it was too high. However a substantial number of young male motorists believe the limit should be over 110 km./hr. The majority of the respondents believe the 80 km./hr. limit on highways is about right and less than 3% thought it is too high. In April of 1982 a supplementary poll was conducted by Gallup for M.T.C. and approximately 1000 Ontario adults were asked:

> "Would you support a speed limit of 90 km/hr. for all motor vehicles on Ontario's expressways?"

Of the 824 licensed drivers who responded, only 53% said they would support the reduction from 100 to 90 km/hr. Most of the drivers were convinced that the present limits are satisfactory but are not being observed and that the O.P.P. should enforce them.

8.3. Car-Truck Size Disparity

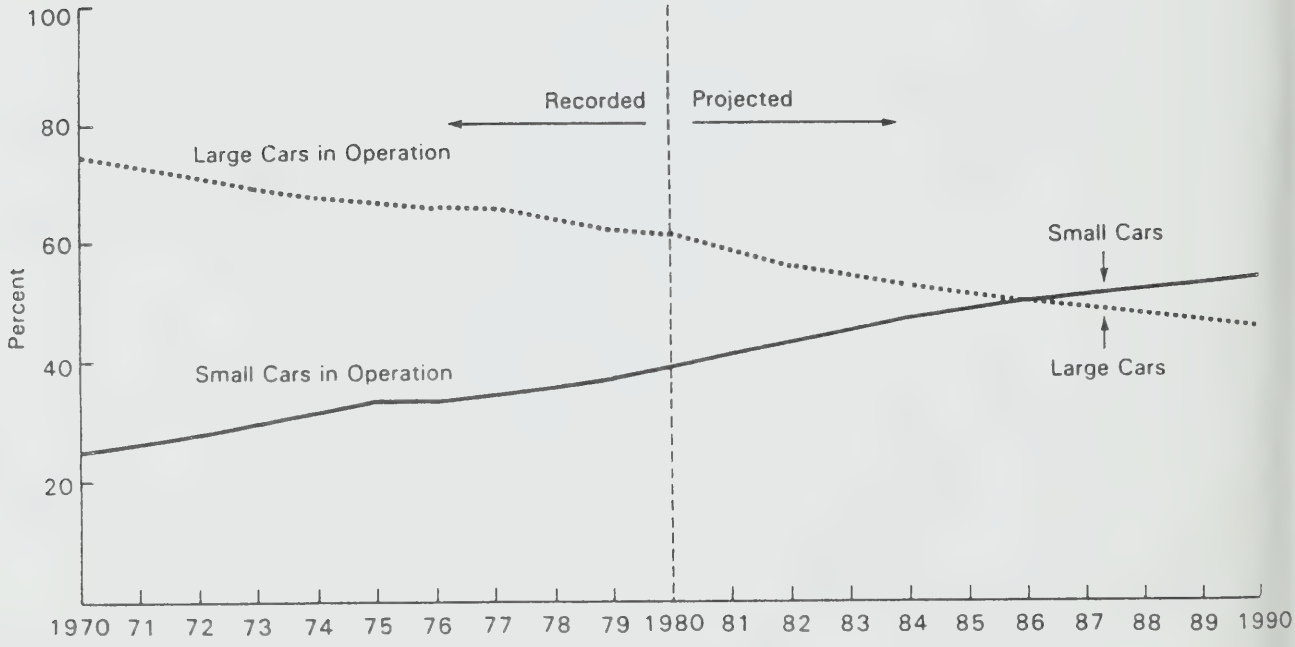
8.3.1. As we pointed out in Chapter I, the fact is that cars have been getting smaller and trucks have been getting larger, and people naturally perceive this to be a most dangerous trend. In order to investigate the situation carefully, the Commission sponsored an independent study by De Lew Cather Canada Ltd. in March 1982. The full report by Kaulback and Eryon, which was made public in October 1982, dealt with the trends in vehicle size; the likely shifts in vehicle population; the resulting mix of cars and trucks; the accident patterns which might be expected; and the factors affecting the frequency and severity of car-truck accidents. The report also includes the most extensive review of the literature available to date plus a comprehensive survey of the opinions of experts in the field. The report identifies over one hundred pertinent documents and provides an annotated bibliography for about seventy of them. During the early work, Delcan discovered that the Ontario M.T.C. was in the process of carrying out two projects on the forecasting of vehicle population and the vehicle mix by size and type. These data will soon be available.

The past trends in Ontario for large, medium and small cars from 1979 until 1981, according to the Ontario Transportation Energy Data Book, show clearly that the percentage of small new cars has increased rapidly since 1976. The vehicle down-sizing since the mid 1970's has been in response to fuel shortages. Length, wheel base and height have all, to a greater or lesser degree, been influenced. Not only are there changes within the standard vehicle size classifications, but people's purchasing habits have changed considerably and consequently the automobile fleet has changed. The total Canadian new car registrations of compacts and subcompacts have increased from 35% in 1970, to 46% in 1976, to 59% in 1981.

Trucks, on the other hand, appear to be getting larger on the average, not so much because each type is larger but because more of the larger ones are being utilized. There was an increase in the number of vehicles with a gross weight in excess of 50,000 kg. from 10,000 to 20,000 in 1980-81 according to data provided by M.T.C. and, in addition, the general trend is toward the use of more articulated combinations. Combinations, however, still account for less than 1.5% of the total of all commercial vehicles.

Fig. 16 shows a forecast to the year 1990 of the demand for large and small cars by Ramsett and Sheerer (see N.H.T.S.A., Small Car Safety in the 1980's). The high growth rate of small car sales is quite evident and, if the trend continues as forecast, it will surpass the proportion of large cars in the U.S.A. about the year 1986. This trend will depend on a number of illusive variables:

Historical and Projected Small and Large Cars in Operation, 1970-1990



Large Cars = Mid-Size and Large
Small Cars = 2-Seater, Minicompact, Subcompact, and Compact
Size Categories Are Based on Environmental Protection Agency's Interior Roominess Classification.

Projections Are Based on Assumption That Small Car Share of New Car Sales Share is 55 Percent for 1980-1990.

Source: R.L. Polk and Co. and the National Highway Traffic Safety Administration

Source: Car-Truck Size Disparity, DeLCan, 1982

(a) the rate of increase in gasoline prices,
(b) the number of gasoline shortages or gluts,
(c) the number of small car imports,
(d) the degree of increase in fuel economy,
(e) the availability of luxury items,
(f) the availability of safety features,
(g) the relative prices of small and large cars.

8.3.2. The probability of a fatality in a car-truck collision depends very much on the relative size of the vehicle as shown in Table XXI.

TABLE XXI

A Comparison of Fatalities in Two-Vehicle Accidents Among Vehicles of Different Sizes

	Compact Car	Mid-size Car	Full-size Car	Pickup, Van or MPV	Combination Truck
Subcompact Car	3.4	6.3	8.2	8.4	51.5
Compact Car		1.9	2.3	3.2	25.0
Mid-size Car			1.3	1.7	28.8
Full-size Car				1.5	25.9
Pickup, Van or MPV					20.3

It can be seen from this table, the source of which is a 1980 paper in Vehicle Mix by the U.S. D.O.T., that the occupants of a subcompact vehicle are 3.4 times more likely to be killed than those of a compact vehicle, in a two-vehicle collision. In a collision with a tractor-trailer, the full-size car occupants are more than 25 times more likely to be killed than the truck occupant, but in a subcompact, the probability of death is 50 times greater for the motorist than for the truck driver!

The accurate prediction of the severity of an occupant injury in a car-truck collision is complicated by the variety of vehicle configurations, varying impact angles, the age of the occupants and whether or not they use seat-belts. In a collision, the velocity of the vehicles involved is changed abruptly but conservation of momentum causes the occupants to continue to move at their original velocity until either restrained by seatbelts, or by collision with some other object, either internal or external to the vehicle. If the decelerations are large and of sufficient duration, then severe local damage or possibly death may occur. Other potentially lethal damage mechanism include penetration of the vehicle by outside objects, occupant ejection, fire or drowning. Due to the complex nature of the vehicle structures and the dynamic interactions

experienced during a collision, it is difficult to relate occupant injury to particular characteristics of the colliding vehicles. However, considerable research work in this area suggests that the change in velocity, delta V, during a collision is currently the best known single predictor of severity because the change in velocity, and therefore in the momentum, controls the forces acting on the occupants.

The National Crash Severity Study in the United States examined the correlation between velocity change and fatality probability (see Fig. 17) The results indicate a significant increase in fatality risk with increased delta V, for both car/car and car/truck collisions and it increases very rapidly as the change in velocity increases beyond 30 kms. per hour. The relationship between the masses, speeds of the vehicles involved in an accident, and the resultant delta V can be derived using the conservation of momentum relationship for inelastic collisions, assuming the vehicles remain together after the collision. Post-collision velocity is the mass of the car times its initial velocity plus the mass of the truck times its velocity, all divided by the sum of the vehicle masses.

8.3.3. The effect of mass ratio is plotted in Fig. 18. In this figure, the three vertical arrows indicate the approximate mass ratios for collisions between:

(a) a straight truck and a large car,

(b) a straight truck and a small car,

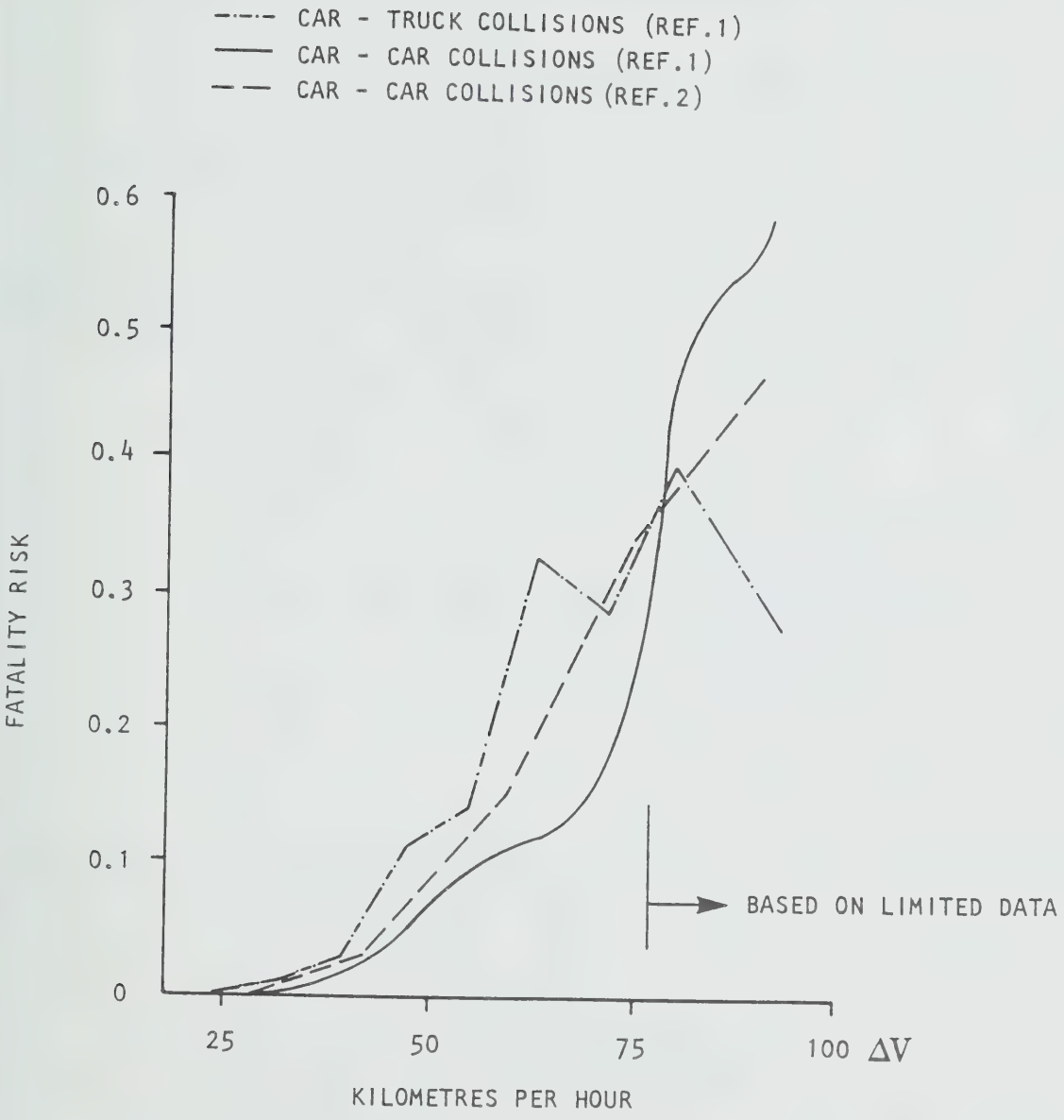
(c) a tractor-trailer and a small car.

On the vertical axis is indicated the change in velocity divided by the initial velocity.

We see that the effect on a car of a collision with a truck 50 times its size is not much greater than that of a truck 20 times its size. The result of this whole examination of size disparity is that the probability of fatality increases with mass ratio but not at a very rapid rate at very large ratios. In other words, it makes very little difference whether the small car occupant is in collision with a small truck or with a very large truck, in both cases the car loses.

The extensive review of literature and discussions with experts lead Delcan to suggest that an overall increase in safety cannot be effectively achieved by limiting, within acceptable bounds, the weight or size of trucks. Certainly truck weights should indeed receive due consideration, especially with regard to their impact on roads and structures. This is currently the subject of extensive research both in the United States and in Canada, and the Roads and Transportation Association of Canada is currently funding a project on uniform regulations of the weights and dimensions of trucks used in interprovincial transportation. However, from a safety standpoint, it appears that size and

FIGURE 17



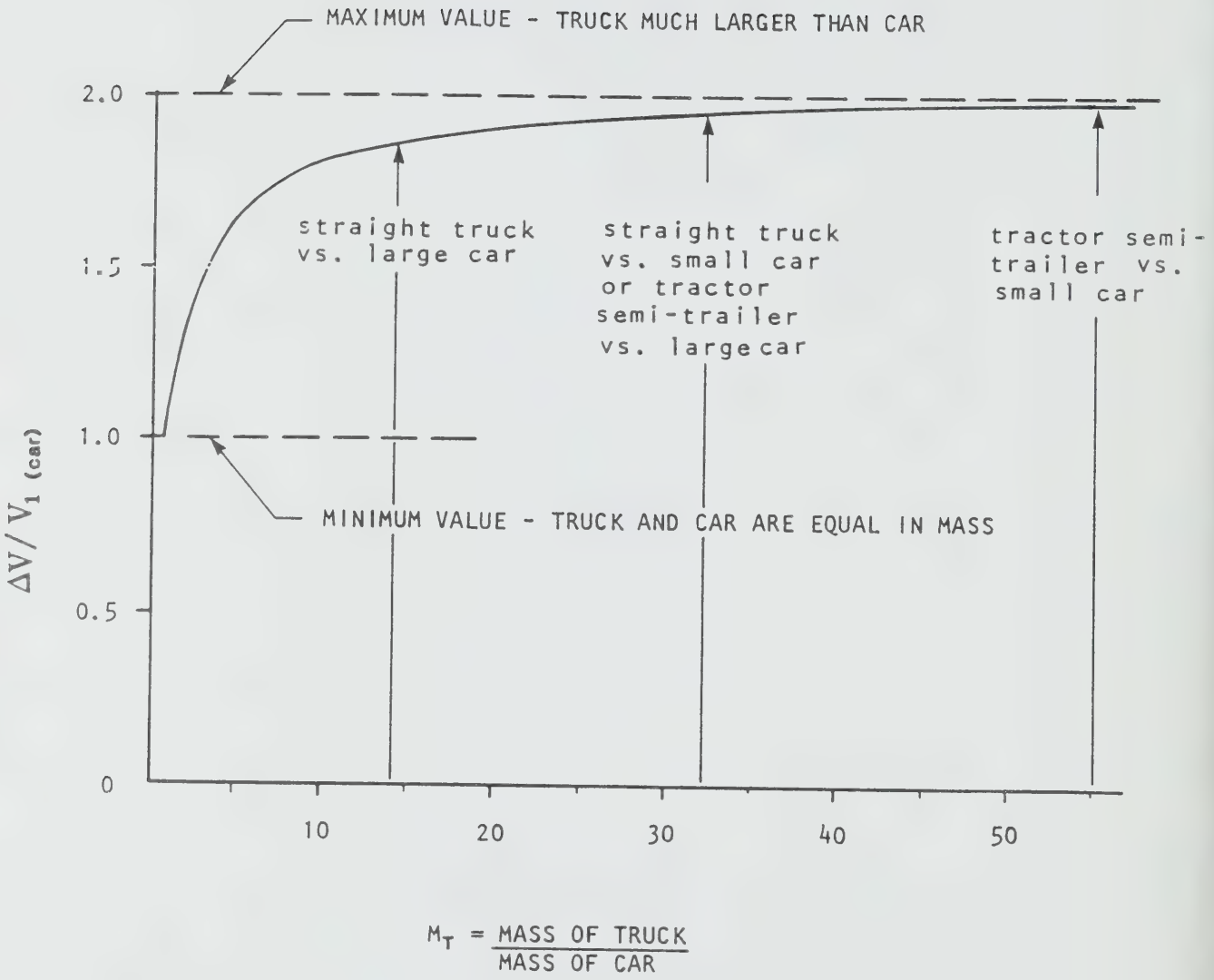
CAR OCCUPANT FATALITY RISK VS. "ΔV"

REFERENCES

(1) JOKSCH H., REIDY J., BIBLIOGRAPHY ITEM NO. 41
(2) NATIONAL CRASH SEVERITY STUDY

Source: Car-Truck Size Disparity,
DeLCan, 1982

FIGURE 18



THE EFFECT OF MASS RATIO ON $\Delta V/V_1$ FOR HEAD ON COLLISIONS

Source: Car-Truck Size Disparity, DeLCan, 1982

weight limitations or standardization offers little potential in car-truck accident severity reduction. For effective fatality reduction, mass disparity must be reduced to a figure approaching one in contrast to the current mass ratios commonly between 30 and 55. Vehicle mass disparity is already so great in these crashes that increased safety can best be achieved by reducing accident frequency. The Delcan 1982 report concluded that:

(a) the disparity in car and truck sizes is not expected to have any significant effect upon the frequency of collisions between cars and trucks,

(b) in car-truck collisions, the degree of car occupant injury is influenced by car size. Any increase in truck size, increasing the truck-car mass ratio above 20 does not have an appreciable effect. The effects of small car size are, however, somewhat ameliorated by technological advances and restraint system use,

(c) where it is to their economic advantage, carriers will tend to utilize trucks as large as appropriate regulations permit. With an increasing use of larger vehicles, presuming that their capacity is utilized, fewer vehicles are required to meet any given level of demand. This reduction in exposure (a safety benefit) will not be offset by an increase in the severity of car-truck accidents (a safety disbenefit), resulting from the increased truck size.

(d) while efforts are constantly being made to improve the crashworthiness of cars, these benefits are principally applicable to car-car collisions. It is difficult to imagine that adequate car crashworthiness can be developed to counteract the inherent advantage that the truck has, from an occupant safety standpoint, by virtue of its much greater mass,

(e) the total number of fatalities resulting from car-truck collisions can best be reduced by concentrating on reducing accident frequency, as accident severity is difficult to influence, given that car downsizing is already well advanced and that the mass ratio in car-truck collisions is already so disparate.

8.4. Overlength Vehicle Combinations

8.4.1. Overlength vehicles have been permitted in Ontario for many years by special permit and only have been issued for cargoes such as long steel girders which cannot be subdivided. The term overlength vehicle is used to describe both straight trucks which exceed the legal limit and tractor-trains, i.e. for articulated combinations of tractor with several trailers. The current Ontario 21 metre limit permits a double, but only in a combination of a tractor plus a semi-trailer plus a small second trailer called "the pup". The trucking industry would like the overall length limit to be increased by 41 feet, i.e. from 21 metres to 33.5 metres because combinations of two or more trailers would then be possible. In parts of the U.S.A. and Canada, such tractor-trains have been permitted for some time under carefully regulated conditions and they are commonly known as "turnpike doubles" or "tractor plus triples". (See Fig. 6). Because their use has been highly controversial, the O.T.A. dislikes the term overlength vehicle and prefers to call them "extended length multiple-unit commercial vehicles".

The Commission has received many letters and submissions expressing concern over the possible extension of current truck lengths. These were from private motorists, automobile clubs, truck driver unions and several truck operators. In fact, concern about the longer truck issues was among the most common expressed.

Representations have been made to M.T.C. in the past, seeking permission to introduce into Ontario over-length truck combinations such as those permitted in Alberta. Canadian Freightways has operated triple-trailer trains between Calgary and Edmonton since 1969 and had an excellent safety record.

In general, the use of turnpike doubles and triples under controlled conditions in the United States has shown an impressive capability for safe freight transportation, but it is not clear how much of the impressive safety record is due to the special controls and highway traffic conditions under which they operate.

In a 1982 report entitled: The Dynamic Response of Multiple-Articulated Truck Combinations to Steering Input, by Ervin and MacAdam of the University of Michigan H.S.R.I., the authors report on the results of two computerized simulations of vehicle rollover tendency during a manoeuver. Their results showed that triples exhibited the largest rearward amplification. The next largest levels were exhibited by rocky mountain doubles, followed by turnpike doubles and a five-axle tractor semi-trailer with a trailer length of 45 feet. Generally, the larger the amplified lateral acceleration, the more likely a premature rollover will occur at the rearmost trailer.

8.4.2. The arguments put forward in support of longer truck combinations may be summarized as follows:

(a) Longer trucks would reduce operating costs, improve truck productivity and improve the quality of service. Fuel savings of 25% to 33% could be achieved because fewer trips are needed for the same amount of freight. The trucking industry also anticipates savings in cargo handling and freight loading, maintenance, parts, labour and repair due to the need for fewer tractors, so the total cost per ton mile should be reduced.

(b) The reduced number of trucks would reduce the chance of car-truck accidents and should an accident occur, it is unlikely to be much more severe than accidents involving conventional truck combinations.

(c) The accident record where they have been allowed indicates that they are as safe, or more safe, than conventional units. This may be partly due to the special operating requirements imposed on them.

(d) They are unlikely to divert much freight from other transportation modes such as railways because of the different nature of the operations.

(e) Splash and spray can be significantly reduced by imposing lower speed limits and requiring the use of splash and spray suppressors. At comparable speeds, doubles and triples with single axles create less spray than conventional tractor trailers with tandem axles.

(f) They would be driven by the most experienced and trained drivers, on routes and at times during which there would be the lowest traffic volume. This would reduce their exposure to accidents.

(g) They would be restricted to the slow lane of multi-lane highways, so passing would not be a significant problem and traffic delays would be unlikely.

(h) A greater number of axles would allow better distribution of loads despite an increase in gross vehicle weight. More axles allow greater resistance to skidding and hydroplaning in wet weather, and they would have no difficulty in meeting required stopping distances.

(i) They would be required to load progressively lighter from the front to the rear; the heaviest loaded axle would be the drive axle and the first axle of the semi-trailer behind the tractor. The rearmost axle would have the most brake effectiveness and, as a result, the whole unit would be stretched out, thus preventing jack-knifing.

The arguments put forward against allowing longer truck combinations may be summarized as follows:

(a) Competition would force other companies to use longer trucks also, which then might attract freight from other modes of transportation. This would increase the number of trucks and increase the exposure to accidents. C.P. Rail estimate that most of their new car traffic would be lost to double 45' trailers in the Quebec-Ontario corridor.

(b) They would require greater manoeuvering time and space, off-tracking and trailer sway problems would increase and they would require extra lanes when turning corners.

(c) They would have difficulty maintaining speeds on up-grades and would disrupt traffic.

(d) They would have difficulty backing up and could become formidable obstacles requiring a longer time to remove if inoperative, thus causing traffic delays.

(e) They would be more difficult to pass and would increase the wind blast, splash and spray.

(f) They would be more difficult to stop and brake adjustment would be crucial.

(g) They would increase the psychological intimidation and stress on other motorists and increase the severity of car-truck accidents.

(h) They would be unsuitable for southern Ontario because of high population density and traffic volumes; short trip lengths between cities; and lack of suitable marshalling yards or access routes.

8.4.3. Through the initiative of Intercity Truck Lines of Canada Ltd. and with the support of the Ontario Trucking Association, the Commissioner was asked early in 1982 if testing and observation of the performance of such tractor-trains could be carried out and if a demonstration could be permitted on a public highway. The Commissioner agreed, provided that first, controlled tests would be conducted off the public roads, and that the demonstration would be permitted only if it were carefully supervised by the M.T.C. and the O.T.A. and controlled by the O.P.P for the safety of the public. In support of their recommendations for longer truck configurations in Ontario, three trucking companies: Intercity Truck Lines (Canada) Ltd., Motor Carriers Ltd. of Oshawa, and International Carriers Ltd. of Oshawa offered to provide the extended length vehicles for testing. The vehicles supplied included:

(a) a twin-trailer Car Carrier in a B-train configuration with a loaded length of 35 metres and having two articulation points.

(b) a turnpike double, or tractor with two 45-foot trailers with an overall length of 33.1 metres and having three articulation points.

(c) a triple trailer unit with three 27 foot trailers, an overall length of 33.1 metres and having five articulation points.

(d) a conventional tractor-trailer combination with a 45 foot trailer.

The details of procedures used and the results obtained are in the M.T.C. research report TVS-CV-109 entitled: Test and Demonstration of Double and Triple Trailer Combinations, by Mercer, Billing and Wokkowicz, August 1982 (See Fig. 19). The M.T.C. Test Facility at Huron Park, Centralia, was used to examine:

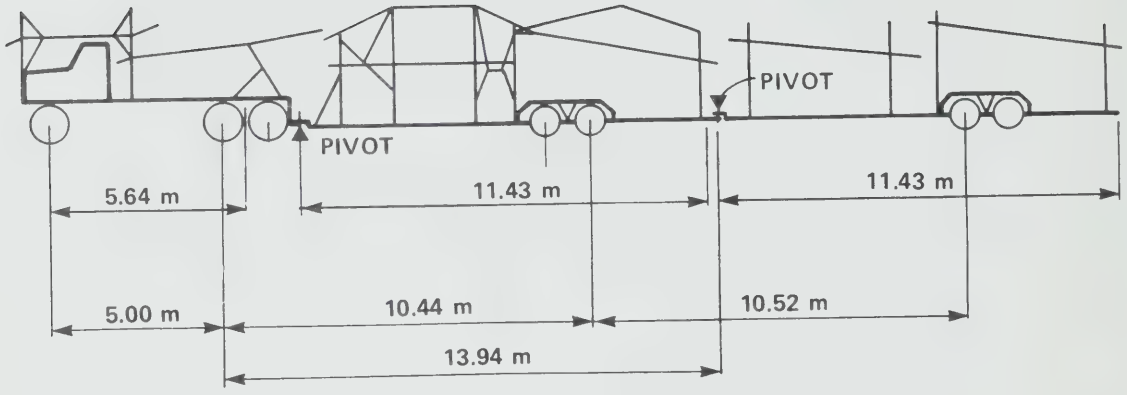
(a) splash and spray characteristics,
(b) lateral acceleration amplification,
(c) air brake timing,
(d) stopping distance, and
(e) offtracking.

The M.T.C. Test Facility is a former Air Force training base at Centralia, Ontario. The north-south runway is 1000 metres long and 50 metres wide, and has a 200 metres section which was repaved to provide a smooth, low-friction surface for testing manoeuvers. The skid-pad is made of asphalt with a mix of very fine angular aggregate. The tests and demonstration were intended to evaluate the performance characteristics of the trucks relative to normal highway operation. Road evaluation was later conducted on Highway 401. The demonstration involved splash and spray measurements, and manoeuvering in confined spaces such as ramps and intersections. Tests were designed for vehicle sensitivity to rapid steering manoeuvers, brake stopping distances and time requirements.

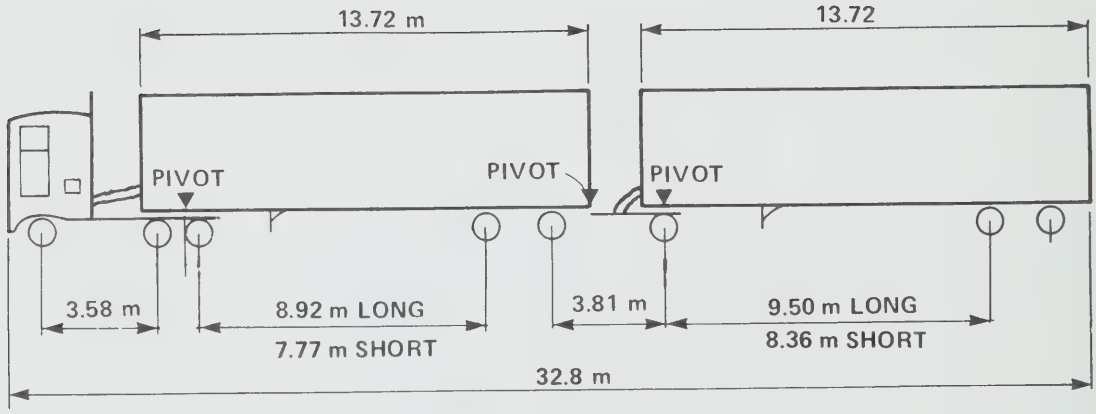
Each train was operated at speeds of about 50, 65 and 80 km./hr. to test its ability to perform an evasive manoeuver, i.e. a lane change and immediate return to the original lane. The lateral acceleration in the tractor and each trailer was measured and it was found that it was amplified at the rear trailer of all the trains. At the highest speeds, the rear wheels of the Triple and the Car Carrier occasionally lifted off the test track. The Car Carrier had a very low centre of gravity, unladen, and tended to skid laterally and it provided a very graphic display of trailer swing when pushed to the stability limits. During the manoeuver, the rear trailer angle became so great that the rear trailer king-pin support assembly struck the rear tail light housing of the lead trailer, causing minor damage. Testing of the Twin 45 was conducted more cautiously than for the other two vehicles. Nevertheless, it was evident that the mode of instability of this vehicle would be rollover, due to its high centre of gravity. All three vehicles exhibited a tendency to whiplash at higher speeds under the severe steer inputs used. The onset of instability observed in these tests was due to the violent steering manoeuvers at high speeds which would only be necessary in an emergency. Driver experience and defensive driving techniques would

FIGURE 19

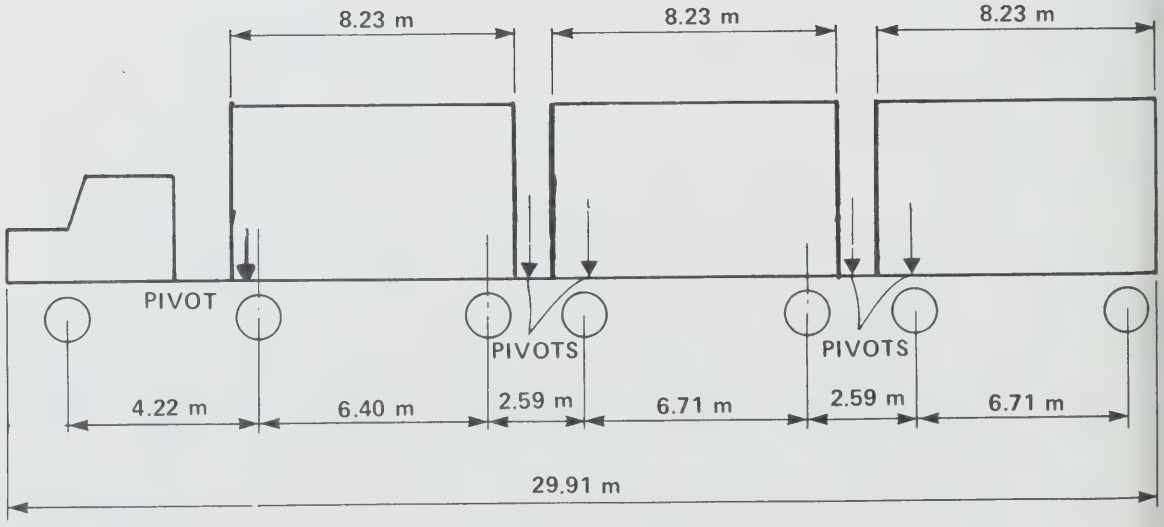
OVERLENGTH COMBINATION TRUCKS



Car Carrier



Twin 45



Triple

Source: Ontario Ministry of Transportation and Communications, Test and Demonstration of Double and Triple Trailer Combinations, 1982, Report TVS-CV-82-109

be the best means of avoiding such manoeuvers, so drivers would have to be well informed about the stability of their vehicle, when loaded and empty, on wet and dry roads.

Brake line air pressure time histories were obtained for the following configurations:

(a) M.T.C. tractor and single trailer of the Triple,
(b) M.T.C. tractor and two trailers of the Triple,
(c) M.T.C. tractor and Triple,
(d) M.T.C. tractor and Twin 45, and
(e) M.C.L. tractor and Car Carrier.

The pressures were monitored by transducers mounted in the airline at the rear axle of each unit, and the brake treadle valve. Brake pedal position was also monitored. The ideal way to bring a vehicle train to a stop is progressive brake application from the rear wheels forward, but the measurements revealed the reverse to be the case. All three vehicles exhibited generally the same delay problems, with a delay of approximately 1.5 seconds from the activation of the brakes on the tractor to the activation of those on the rear trailer, and the release times were even worse with approximately a four-second delay. This condition is potentially hazardous and did not meet legal requirements. Excessive release times also increase brake wear and lower overall fuel efficiency. The performance of the test vehicles showed that, even though the techniques to improve brake system timing are currently available on the market, they were not being used. However the owners of the vehicles showed a strong interest in cooperating.

The Car Carrier was equipped with anti-lock brake modules but did not appear to have the system active during the test. The Triple and Twin 45 were not equipped with anti-lock brake systems. The unloaded vehicles all locked most of their wheels during this test which reduced the exercise to a measurement of tire-pavement adhesion. With locked wheels, the stopping distance is a function of vehicle weight, initial speed, and the coefficient of kinetic friction. The heat generated at the brake drum was minimal as a result of the near instantaneous wheel lock, so stopping distance did not decrease with the number of stops.

A test was conducted at Centralia in a dry atmosphere on the wetted asphalt test strip. Each vehicle made two passes at 72 km./h. and was observed from in front and from above. The Car Carrier appeared to generate the smallest spray plume. Spray was generated at relatively low levels, and extended out approximately 2 metres. It was observed that the front tractor wheels contributed greatly to the spread of the plume, but the spray suppression devices tended to reduce the overall magnitude of the spray envelope. The Triple appeared to create the greatest spray. The spray generated appeared to be the same as that of the Twin 45, but was initiated rather close to the front of the vehicle and showed less tendency to

settle. The comparison tests at Centralia illustrated the point that anti-spray devices and trailer design do improve spray suppression but do not entirely eliminate it.

Offtracking is the amount that a vehicle component deviated from the path of the steered member. All the overlength trains generated larger swept areas and higher offtracking than a tractor with a single (45 ft.) trailer. The magnitude of the offtracking of the overlength vehicles was such that access between major highways and truck terminals would be limited by intersection and roadway geometry.

8.4.4. The roadway demonstration took place 22 June 1982 on Highway 401 eastbound from Oshawa to Belleville in the morning and returned westbound in the afternoon. A thorough pre-trip inspection was carried out at the M.C.L. Motor Carriers terminal south of Oshawa by M.T.C. inspectors. The three tractor-trains used municipal streets to reach Highway 401. The demonstration was controlled from the air by Mr. Don Parke of the Ontario Trucking Association. Vehicles were restricted to a maximum speed of 90 km./hr. but the average speed was approximately 75 km./hr. The traffic conditions were light and the weather was clear until the last 20 kms. of the return trip when heavy rain was encountered. The trip was made without incident and without a police escort, and in the afternoon the O.P.P. helicopter was not needed.

The demonstration was witnessed by the Commissioner, the members of the Advisory Group, the Commission staff, representatives of the owners, and several experts from the M.T.C., the O.T.A. and the Hamilton Automobile Club. Particular attention was paid to observations of:

(a) response to lane change,
(b) response to traffic,
(c) passing and being passed by traffic, and
(d) splash and spray effects.

Occasions were noted when, as a result of slowing during grade coimbing, the traffic accelerated and overtook the trucks. Different drivers in the overlength trucks exercised different strategies in negotiating the ramps off and on Highway 401. During sharp, tight radius turns, all the vehicles intruded into adjacent traffic lanes to varying degrees. Although this is not a problem in itself, long and wide sweeps into the adjacent lanes can interfere with other traffic, both vehicular and pedestrian (see Fig. 8).

The Car Carrier demonstrated the least sway of all three test vehicles during the on-road operation. The stability of this particular combination is due largely to the fact that it has only two articulation points, compared to five on the Triple and Three on the Twin 45. The Car Carrier exhibited "dog-

tracking" which was well beyond the legal limit of 76 mm. and which was not evident for the other trains. The dog tracking was less pronounced on recently-paved sections of the highway. The lane-changing characteristics of the trains appeared similar to those of other trucks which were on the highway at the same time but the Triple exhibited the most pitch and yaw. All three trains exhibited potential adverse dynamic defects even under the ideal conditions prevailing at the time.

During the demonstration on Highway 401, the reaction and interactions between the overlength vehicles and other highway traffic were observed and recorded. The demonstration was conducted without advance warning, so traffic on the highway was not expecting atypical trucks. All trucks passed and were passed by various sized automobiles. The manoeuvering ability of the trucks was such that they tended to interface very effectively with the traffic on Highway 401 that day and automobile drivers appeared not to notice the fact that the vehicles overtaking them were of abnormal size. Movements in and out of heavy traffic were executed efficiently and with no evident hazard, the vehicles appeared to be accepted, and their performance was such that their presence for the most part went unnoticed.

During the overtaking exercise, there were no noticeable indications of aerodynamic buffetting over that normally sustained from tractor trailers. The effects of air displaced by the overlength trucks on M.T.C.'s full size station wagon was negligible. There was no indication that trailing wakes and vortices generated by the overlength vehicles were greater than those produced by normal semi-trailer combinations. The Car Carrier was fully equipped with National Rubber "Rain Trapper" anti-spray mudflaps and the wheels were enclosed by metal fenders while the Twin 45 had "Rain Trapper" anti-spray mudflaps on the tractor and standard mudflaps on the trailers. The Triple had standard mudflaps on both tractor and trailer. When the heavy rain commenced, the Car Carrier was laden with automobiles, in contrast to the empty vehicle tested at Centralia, and the moisture present on the 401 was as a result of falling rain, water flowing from the surfaces of the cargo and ground spray generated by tires, and not just the latter as during the tests at Centralia. During the rainy portion of the Highway 401 demonstration, it was observed that the spray generated by the test vehicles was no worse than that generated by standard tractor trailers operating that day at similar speeds. However, the drivers of automobiles passing or being passed by one of the overlength vehicles were subjected to poor visibility for a longer period because of the greater time required to overtake. The M.C.L. Car Carrier's antisplash system was noticeably better than the other trains.

Experience has proven that any substantial interference in a traffic flow pattern is a potential accident-causing factor and the most common type of

traffic flow interference is the slow-moving vehicle. A vehicle moving at a low rate of speed in comparison to other vehicles causes other traffic to follow too closely and take risks in passing. Of the three vehicles tested, the M.C.L. Car Carrier had the lowest power to weight ratio, approximately 340 lb. per brake horse power, and this contributed to its lacklustre performance. The unit had great difficulty in attaining 80 km./hr. even on flat terrain and often dropped well below 50 km./hr. on the grades, and was an example of a grossly underpowered truck; the I.C.L. Twin 45 was adequately powered; the Intercity Triple had the highest power to weight ratio, approximately 260 lb. per brake horsepower and was able to maintain normal highway speeds and interact safely with the flow of traffic.

8.5. Hazardous Goods

8.5.1. Although the issue of the transportation of hazardous goods by truck was deliberately omitted from the terms of reference of this Commission, the subject was raised several times and the Commissioner feels obliged to point out that hazardous goods are an integral part of the public perceptions of highway safety. This perception is based on real concern and will not go away.

The Government of Canada passed the national Transportation of Dangerous Goods Act which received Royal Assent on 1 November 1980, but it has not yet been promulgated. Ontario, like the other provinces, is waiting for the regulation before proclaiming its own Dangerous Goods Transportation Regulations. The federal act requires all carriers to abide by prescribed safety standards for packages and containers and the display of warning signs. Violators will be liable to fines of $50,000 for the first offence; $100,000 for each subsequent offence, or two years imprisonment in extreme cases. Work on this legislation began about eight years ago and will apply to all goods which may pose a threat to people (gases, liquids and solids). The Act embraces all modes of carriage including air, road, rail and marine transport and some pipelines. Excluded from the Act's jurisdiction are: chemicals transported under the sole control of the Federal Department of National Defence; transportation of oil and gas by pipelines (already governed by the National Energy Board Act or the Oil and Gas Production and Conservation Act); in vessels regulated by the Canada Shipping Act, and by any provincial law.

The proposed Canadian regulations are based on and compatible with United Nation recommended regulations. During the last decade, most industrialized nations have adopted the UN guidelines and this has had a beneficial effect on the compatibility of international trade. The Canadian decision to follow the UN guidelines has, however, introduced some conflict with the United States Code of Federal Regulations, Title 49. Before the Act can be put into effect, a detailed set of regulations must be developed. Federal-provincial agreements must be reached which define jurisdictions, administration and enforcement responsibilities. Several provinces have urged the Federal Government to introduce the detailed regulations soon or they may take unilateral action.

The proposed regulations will require prescribed placards on the outside of any vehicle carrying a dangerous commodity. The placards are diamond shaped and colour coded, and have an identification symbol and a United Nation's hazardous product number. The placarding system will allow personnel to identify the nature of the dangerous goods being carried, the hazard and appropriate emergency actions. An Emergency Response Guide for Dangerous Goods' manual has been prepared and published by Transport Canada for use by enforcement and emergency personnel in the event of an accident.

The O.P.P. supports the placarding of commercial vehicles carrying dangerous goods and welcomed the development of the emergency response resource manual. It was proposed at a Commission's public hearing that the Federal Government should initiate a public education program to inform the motoring public of the hazard outlined on the dangerous goods identification placards.

8.5.2. The Regional Municipality of Sudbury in its presentation to the Commission highlighted several recommendations of the Provincial-Municipal Working Group on the Transportation of Dangerous Goods. These included a recommendation that the Province of Ontario be requested to enact enabling legislation permitting municipalities to pass by-laws regulating the parking and routing of vehicles transporting dangerous goods. The Province was also requested to undertake to create a data bank on the movement of dangerous goods throughout the province, and that this information be made available to the municipalities affected so that adequate land use planning, transportation system planning and emergency response planning could occur. And finally this group recommended that, for reasons of both stability and manoeuverability, A-train pup trailer configurations not be permitted to transport dangerous goods.

In Alberta, municipalities have the power to enact by-laws covering the handling of dangerous good within city boundaries on roads but not for rail movement. Edmonton has designated certain routes for movement of dangerous goods and has placed time restrictions for their movement in other areas. The Council on Uniform Traffic Control Devices for Canada has recently approved dangerous goods route signs to be used for control of the transport of hazardous products. The Council felt that uniformity of such signs was important in anticipation of the new regulations under the Transportation of Dangerous Goods Act.

The Resource Centre for Occupational Health and Safety at Lakehead University in a presentation to the Commission at the Thunder Bay public hearing, reviewed the results of their study: The Movement of Chemicals in and through the City of Thunder Bay. Their presentation noted there is a definite lack of emergency response training being provided for drivers. Secondly, the flow of traffic carrying dangerous goods through built-up areas such as Thunder Bay is not regulated at present, so they recommended that specific routes be designated for dangerous goods through or around urban areas. Finally, they observed that there is a lack of information regarding the types of commodities being carried by road in Ontario and so recommended that a study be implemented to expand existing data on commodity flow.

The Canadian Institute for Radiation Safety in a presentation to the Commission at the last Toronto public hearing recommended "that a more realistic awareness of the potential hazards involved in the trucking of radioactive materi

in Ontario would benefit drivers, police officers, fire departments, ambulance crews and M.T.C. personnel."

8.6. THE COMMISSION RECOMMENDS THAT:

1. Transport Canada should not permit the importation of ultra-small motor vehicles intended for a single occupant and weighing less than 700 kgm. In any case they should not be permitted on public highways or multi-laned expressways until they are proven to be crash-worthy.

2. The present overlength vehicle regulations should NOT be changed, and overlength combinations, or those with more than three articulation points, should NOT be permitted in Ontario at this time.

3. The Ontario Government should request observer status on the new U.S. Department of Transport study of longer combination commercial motor vehicles on the National System of Interstate and Defence Highways. The M.T.C. should suggest that the study's terms of reference be extended to include the need for special driver qualifications, marshalling yards, speed limits, dangerous cargo restrictions, and the possible impact of such an intercity network on railways and shipping.

4. The Ontario Government should request the Government of Canada to implement the Transportation of Dangerous Goods Act and its regulations as soon as possible and, if it does not do so within a reasonable length of time, Ontario should implement its own Dangerous Goods Transportation Regulations.

CHAPTER IX SUMMARY

9.1. Conclusions

9.1.1. The Commission has concluded that in Ontario the present methods of collecting and analyzing traffic accident information are better than in most Canadian provinces and American states, but they are still inadequate for the identification of the specific causes of accidents involving large trucks. Present methods tend to concentrate on information needed for legal purposes and tend to deal with technical matters to the neglect of human and medical factors such as driver training, experience and condition. There is too great a temptation to use the existing data for propaganda rather than for objective analysis. The information gathered at the scene needs to be supplemented with post-accident investigations and analysis (behond the present capabilities of the police) which should be sufficient to reconstruct an accident scene with confidence. It is not sufficient, in view of the growing risks to the motoring public, for the M.T.C. to provide only two or three expert traffic engineers on an ad hoc basis, nor to conduct only spasmodic research.

9.1.2. The inherent difficulties in the operation of trucks, combined with the potential hazard that trucks pose for other road users, provide justification for requiring that the licensing standards for truck drivers be very stringent. Most employers demand driving competence well beyond the minimum level necessary for a Class D licence. The consensus is that the M.T.C. written and road examinations are too lenient and the Truck and Bus Driver's Manual is inadequate. There is a real need for special testing and recognition of drivers of air-brake and combination trucks and this can be done most easily by requiring endorsements to the present classes of licences. There are wide variations in standards between provinces and states, which should be minimized in order to maintain reciprocity. The present Ontario Driver Certification Program is satisfactory and so is the probationary system but the qualifications to be an examiner need improvement. The Commission has concluded that the present Ontario Classified Driver Licensing System is relatively good but needs modifications to correct a few glaring anomalies.

9.1.3. The situation is much worse with respect to the training of both drivers and of their instructors. Candidates are not required to take any formal driver training and, when they do, the admission requirements are too low, the courses are too varied, are often too easy and fail to meet the M.T.C. guidelines. There is no consensus on what should be taught or who should do the teaching. There is no comprehensive, standardized course for instructors, and the qualifications to be licensed to teach do not ensure good instructional ability as well as knowledge of the subject. Defensive driving, advanced driving and emergency

driving courses are limited and the special skills required to drive multiple combination trucks are taught to only a few.

9.1.4. On the other hand, the medical requirements seem to be satisfactory and fall short of those recommended by the Canadian Medical Association on only a few issues. Again, there is too much variability between jurisdictions outside Ontario so that reciprocity of licensing is a problem. The medical examination system is very secretive but there seems to be adequate provision for waivers and appeals. A good deal of research is still needed about the causes of fatigue and the extent of drug use among truckers, but the case against drinking and driving is overwhelming.

9.1.5. The monitoring of driver performance is lax and the demerit point system and penalties appear to be too lenient. Employers have difficulty discovering if their employees have incurred traffic violations. The hours of work legislations are too variable and the permissible maximum working periods are very long Company incentive plans and recognition of safe driving appear to be successful and should be encouraged.

9.1.6. There are enormous variations in permissible sizes and weights of trucks across Canada and the U.S.A. and unfortunately this is unlikely to change very rapidly because of the wide variety of local road, weather and traffic conditions. Reciprocity of vehicle safety standards between jurisdictions is highly desirable but should not be allowed to reduce the current relatively high standards of the province of Ontario. Perhaps Canada should strive to have a recognized network of interprovincial highways such as the U.S. National System of Interstate and Defence Highways. Brakes, especially air-brakes, are critical to safe operation of trucks and require special knowledge, training, inspection and maintenance Jack-knifing, trailer sway and rollover are major problems but protective devices have not yet been sufficiently developed to be made mandatory. The best solution is to slow down to speeds appropriate to the driving conditions!

9.1.7. The regulations governing retreaded tires are inadequate and the permissible stopping distances are too lenient. The cabs of many trucks are far too noisy but it will be difficult to achieve improvements rapidly except on new vehicles. The contribution of noise to driver fatigue and the importance of fatigue as a cause of accidents is not yet really understood. Load security remains a problem in the forestry, sand and gravel, and waste disposal industries. Cab-over-engine tractors are less desirable than cab-behind-engine from the point of view of safety, and too many trucks have inadequate power for the loads they carry and are unable to maintain adequate speeds on upgrades.

9.1.8. There is an identifiable relationship between good maintenance and good safety and, while there are arguments about this, the extent to which mechanical failures cause truck accidents appears to be as much as 20% which is far too high. The leading defects involve brakes, tires, wheels and lights, which can all be avoided, so rigorous inspection and maintenance requirements are quite justified. Pre-trip and post-trip driver inspections, coupled with critical item inspection, selective roadside inspection and compulsory periodic motor vehicle inspection are all called for.

9.1.9. There is a very high number of loss-of-control accidents on wet or slippery surfaces but there is not much that can be done about the weather, so the best solution is to slow down. Wind and blast effects of trucks are annoying or even frightening but there is little evidence that they are important factors in truck accidents. Blindness due to splash and spray is more hazardous, especially during passing, and the effects increase rapidly at speeds over 80 km./hr. Conventional mudflaps do not suppress spray effectively and research on new types of anti-spray flaps and skirts is promising but not yet at a stage where they should be made mandatory.

9.1.10 Most accidents occur on urban roads, most fatalities are on rural roads. In the past there were far too many collisions with parked vehicles so the 1982 roadside parking ban was justified. However, more off-highway rest areas are now needed. Most accidents occur on straight and level roads, and rollovers, while spectacular, are infrequent. Underpowered trucks lead to traffic congestion and tailgaiting, so truck climbing and passing lanes are desirable. Runaway trucks caused by brake failure on grades can be reduced by better brake maintenance but warning signs and escape ramps for steep grades are highly desirable. The very high accident rate at intersections should be capable of being reduced by the use of warning signs and by reduced speed limits. The M.T.C. program of hazard removal and the use of safety barriers, crash cushions and better road markings is helping to reduce the frequency and severity of truck accidents.

9.1.11. Most accidents occur during daylight, especially during rush hours and not on Sundays. However, more fatalities occur in the dark. The obvious conclusion is that the high number of accidents is very closely related to the high number of vehicles, which should surprise no-one. The solution is to reduce the congestion by providing alternative routes or by restricting traffic during rush hours, and by introducing lower speed limits.

9.1.12. The most common violations of the Ontario Highway Traffic Act are: failure to yield the right of way; speeding; loss of control; and following too close. When these violations are compared with the accident data for combination

trucks, it is seen that speeding is by far the most serious offence, followed by lane-hopping and tailgaiting. Mechanical failures and inadequate load retention are dangerous but correctable. The number of speeding violations is very large and is increasing, but convictions are difficult to obtain in Ontario courts. The Ontario speed limits are consistent with those of other Canadian provinces but are higher than those in the U.S.A. The Ontario law lacks a clause about "reasonable and prudent speeds for the conditions prevailing" so the police have to lay charges of careless driving. The U.S.A. 55 m.p.h. (90 km./h.) speed limit has been very effective in reducing the number and severity of accidents but drivers still exceed the U.S.A. limits. A uniform traffic pace is very desirable, and driving either too fast or too slow relative to the normal traffic flow is very dangerous. However, from the point of view of an individual driver, the safest speed is about 10 km./hr. faster than the pace. It is also apparent that the risk is significantly greater at night. Driving in the passing lane and failing to keep to the right are both illegal and dangerous. The Ontario 60 metre following distance is far too short for our speed limits and it should be at least 90 metres.

9.1.13. The M.T.C. Traffic Management Program is very good and should be implemented as fast as possible before the expressways become unmanageable. The Highway 401 Metropolitan Toronto Bypass has already exceeded its design limits over much of its length and is no longer a bypass but a commuter route as well. Drivers attempt to make up for lost time in congested areas by flagrant speeding in the more open sections. A new route similar to the circle roads, beltways or outer ring roads around other major metropolitan areas is badly needed. Because of the presence of Lake Ontario, it would likely have to be a semi-circular ring road and would also require truck access routes to the city centre. The need for truck routes designated by local municipalities is understandable, logical and desirable from the point of view of safety.

9.1.14. Sunday trucking privileges have been abused regularly and the Lord's Day Act is inadequate and should be repealed or be replaced by provincial laws. The proposals submitted by the Interministerial Committee for Sunday and Weekend Trucking are quite justified and set out effective, enforceable policies that would help to alleviate holiday traffic congestion and improve highway safety. The Commission found the O.T.A. objections to Friday restrictions unconvincing, because they assume the use of the public highways is a right, not a privilege.

9.1.15. The risk of death in motor vehicle accidents is quite high relative to other causes of death but the public seems to be willing to accept high risk on the highways. Despite efforts to educate drivers, especially professional truck drivers, about the actual risks, some drivers continue to have a high level of acceptable risk. While the preferred way to reduce this would be by improving

motivation, it is still essential that there be adequate sanctions and enforcement to ensure compliance with the laws so as to protect the public.

9.1.16. The St. John Ambulance Society first-aid training (or its equivalent) is highly desirable for professional drivers as they can be of great help to the police and the medical profession in an emergency. Buses and heavy trucks should be regarded as the workplace and so should be required to carry a first-aid kit as prescribed in the Workers' Compensation Act.

9.1.17. The Ontario demerit point system for traffic violations is sound in principle but the demerits, fines and suspensions are too lenient for truck drivers. The demerit system should be revised after the probationary licensing system with warning letters, interviews and suspensions at lower levels of accumulated demerits for truck drivers than for motorists.

9.1.18. The Commission found that there was widespread ignorance of, or disregard for, the requirements of the Ontario Occupational Health and Safety Act. Some drivers claimed they were forced to drive unsafe vehicles or face dismissal. This is clearly improper and the Ministry of Labour should investigate.

9.1.19. Police visibility is very important to deterrence and the most effective use of police resources is in highly visible vehicles, in saturation patrols and in selective law enforcement patrols. Modern electronic, photographic and closed circuit television techniques of traffic surveillance are past the research stage and should be implemented rapidly.

9.1.20. With the abandonment of federal requirements for drivers' log books, it becomes imperative that tacographs be installed in heavy trucks so as to monitor speeds and hours of work regulations.

9.1.21. In order to increase the ability of government and the police to enforce the laws and to trace carriers who defeat the enforcement system, there is a real need for incentives for responsible behaviour and penalties for repeated misbehaviour. The proposal for a new Commercial Vehicle Operator's Licence, put forward by the Ontario Trucking Association, would be of great assistance from the point of view of safety.

9.1.22. Truck Rodeos and awards for safe driving have been quite successful and are respected and valued by truck drivers. Some innovative roadside signs have proven to be effective in motivating drivers to drive safely and should be encouraged.

9.1.23. Attendance at Public Hearings, letters from individuals, and the response to the public opinion survey correlated rather well with the geographical distribution of bad accidents. Press and television accounts may dramatize factual reports and are rather poor in educating or informing the public about the causes of accidents. There was a very good response to the Commission's opinion survey and the responses stand up to validity checks so that the Commission is confident that we have a balanced view of the total public concern. Most of the complaints related to driver behaviour which correlates very well with the actual accident data so the public perceptions are well grounded and are not badly distorted. It is very important to be able to conclude that the perception is NOT the problem!

9.1.24. The motoring public and the truck drivers have both appreciated that speeding too fast for the prevailing conditions, tail-gaiting and lane hopping are the worst and most dangerous practices and, while the public may be ignorant of all the technical reasons why this is so, the public perception is correct. The most common suggestions were to segregate the trucks and to educate the motorist. These are both in the correct direction but the public appears to be either ignorant of, or unwilling to acknowledge, that the best solution is to slow down. The Gallup polls reveal that, while the motoring public believes the present speed limits are not being enforced but should be, the same public would object to lower speed limits for themselves even though safety would improve. They would be happy to have lower speed limits and segregated routes for trucks, especially those carrying hazardous goods.

9.1.25. Cars are getting smaller and trucks have been getting larger to the point that they are now so large that the severity of accidents does not increase much with more increases in size. The best solution is to reduce the frequency of car/truck accidents by slowing down, by segregation, by better enforcement of the law and by a massive educational program for both motorists and truck drivers.

9.1.26. Overlength vehicles have been used quite safely in parts of Canada and the U.S.A. but only under very highly regulated conditions and on a limited number of suitable highways. The arguments pro and con are still highly controversial and public apprehension about their possible use in Ontario is very high. The basic assumption that their use will reduce the number of trucks on our highways, and so reduce the risk of bad accidents is based on inadequate and unconvincing data. Ontario lacks the controlled turnpikes with the accompanying marshalling yards and access routes which are necessary at major urban centres, like metropolitan Toronto. Despite careful preparation by the owners and the use of exceptionally skilled drivers, all three of the overlength vehicles evaluated

under the auspices of this Commission failed fundamental off-road controlled tests and simple manoeuvering tests on the public highway under almost ideal conditions. All three units had unsafe brake timing. The car carrier was so underpowered that it interfered with traffic and exhibited poor tracking. The Intercity triple exhibited unsafe pitch and yaw trailer sway tendencies under a variety of conditions. The I.C.L. double had difficulty negotiating ramps and corners as well as exhibiting excess trailer sway under several types of manoeuvers. It is obvious that further engineering improvements should be carried out on these vehicles, especially braking, and further tests made before such vehicles be considered for even special permit. There seems to be little justification to change the present regulations at this time and the best policy seems to the Commission to be to monitor, or play a part in, the new studies which are about to take place in the U.S.A. under the Surface Transportation Assistance Act of 1982.

The M.T.C. oversize-overweight special permit guidelines would seem to be adequate, both in satisfying the needs of the trucking industry and the economy of the Province, and also in assuring that the safety of other road users is not jeopardized.

9.1.27. There seems to be no easily understood explanation as to why the Government of Canada is taking so long to implement the regulations governing the truck transportation of hazardous goods. It is to be hoped that they will be implemented soon and if not, Ontario should proceed unilaterally rather than wait until some major serious accident precipitates hurried unrehearsed response.

9.2. Summary of Recommendations

9.2.1. In order to maintain perspective and to discriminate between the many recommendations which were listed at the end of each of the previous Chapters, the Commissioner believes that it is important to identify the principal recommendations. It is also important not to get caught up in details or to become mesmerized by technical matters, especially when most of the evidence indicates that the major problem lies with human behaviour. It is the Commissioner's judgement that the recommendations of greatest significance are:

II 4. re multi-disciplinary accident investigation
III 9. re training programs
III 14. re medical impairment
VI 1. re speed limits
VI 2. re following distances
VI 5. re Metro Toronto Ring Road
VII 3. re demerit point system
VII 9. re commercial vehicle operator licence
VIII 2. re overlength vehicles.

THE COMMISSION RECOMMENDS THAT:

II 1. The Ministry of Transportation and Communications should increase its efforts to collect, standardize, analyze and share truck accident data throughout Canada and the U.S.A. The research effort in identifying causes rather than involvement should be given the highest priority.

2. The recent initiatives of the O.P.P. and the R.C.M.P. in the upgrading of police officers' skills in accident investigations should be encouraged and expanded so as to include more police from the larger urban centres like Metro Toronto.

3. The M.T.C. and the O.P.P. should jointly design an Ontario Truck Accident Report, to supplement the existing accident report, and also establish the circumstances when the supplement should be required. In doing so, they should consult the insurance industry and the medical profession as well as trucking and automobile associations.

4. The M.T.C. and the O.P.P. should jointly establish at least one permanent Multi-disciplinary Accident Investigation (M.D.A.I.) team for the purpose of investigating heavy truck accidents in Ontario. The operational control should remain with the O.P.P. but the experts could be drawn from other police forces, medical associations, universities and colleges, as well as from the staff of the M.T.C. This M.D.I.A. team should coordinate its operations and methodology with similar projects of Transport Canada for passenger cars and light trucks, especially when car-truck collisions occur. The M.T.C. and Transport Canada should cooperate in post-accident reconstruction and the synthesis of data, and the results should be made public.

III 1. The Ministry of Transportation and Communications should review and evaluate the truck drivers' tests under development by Transport Canada and by the U.S.A. National Highway Traffic Safety Administration. Ontario should support initiatives to achieve reciprocity in testing procedures between provinces and states.

2. In order to have a credible testing program, and a consistent standard of licensing, M.T.C. driver-examiners should hold at least the class of licence being applied for by the applicant, as is currently required in Saskatchewan and Manitoba.

3. The performance test for any class of licence should be conducted in a vehicle which is typical of that class. Class A applicants should be required to take the test in a tractor-trailer. The performance test should include an approved pre-trip vehicle inspection.

4. The written test should be made more comprehensive and should include knowledge of the vehicle dynamics, emergency driving, mechanical failures, cargo security, first aid practices, effects of fatigue, alcohol and drugs, as well as the requirements of the Highway Traffic Act.

5. The M.T.C. should implement an air-brake licence endorsement program and a combination vehicle endorsement program as soon as possible.

6. The present Probationary Driver System should be extended to Classes D and A and should require the successful completion of a professional driver improvement course approved by the M.T.C. Individuals should first hold a valid Class D licence to be eligible for Class A.

7. Class B and C bus drivers should NOT be permitted to drive heavy trucks without first qualifying for a Class D licence, and Class D licence holders should be re-examined periodically as are Class A holders at present.

8. The Canadian Conference of Motor Transport Administrators, in consultation with the Canadian Police Information Centre, should examine the feasibility of establishing a Canadian National Commercial Driver Register in order to identify licences which have been remoked or which are under suspension, and to control multiple licensing.

9. The terms of reference and membership of the Provincial Consultative Committee on Truck and Tractor-Trailer Driver Training should be strengthened and the Committee should be asked to review the curricula proposed by Transport Canada and the U.S. Bureau of Motor Carrier Safety, and to make recommendations for the up-grading and accreditation of formal programs for the following levels of instruction:

(a) Straight truck driver
(b) Tractor-trailer driver
(c) Advanced driver
(d) Multiple trailer driver
(e) Driver Instructor
(f) Chief Driving Instructor

10. The Driver Certification Program for the granting of Recognized Authority status should NOT be extended to private truck driving schools until the above review is completed.

11. Straight truck driver training should be considered a vocation under the Private Vocational Schools Act, as tractor-trailer driver training is at present, and M.T.C. should develop minimum qualifications and establish examinations for the licensing of the various levels of driving instructor.

12. All the recommendations of the Canadian Medical Association in the Fitness to Drive Guide should be adopted by the province of Ontario. The Commission endorses thd C.M.A. recommendations for the ages and periods at which truck drivers should be re-examined medically.

13. The M.T.C. should tighten the conditions for granting medical waivers for truck drivers suffering from hearing problems, cardiovascular diseases, and metabolic diseases.

14. The M.T.C. should cooperate with the U.S.A. National Highway Traffic Safety Administration in its proposed research into medical impairment, including that on alcohol and drug involvement.

15. The M.T.C. should prepare and distribute a brochure outlining the dangers of consumption of combinations of alcohol, medication or drugs.

16. The Commission endorses the joint recommendations of the Canadian Bar and the Canadian Medical Associations and recommends further that blood alcohol tests should be mandatory for all truck drivers who are involved in fatal accidents.

17. The Government of Canada, in consultation with the Canadian Medical Association and enforcement agencies, should investigate the desirability of lowering the presently permissible blood alcohol levels.

IV 1. Driver instruction should include information on how the commercial motor vehicle's service and emergency brake systems operate, and the limitations of these braking systems under normal and emergency operating conditions.

2. The Federal Government should require that all the wheels of new commercial motor vehicles and trailers be equipped with brakes, and further, that the Canadian air brake standard should include actuation and release time requirements similar to those in the United States.

3. The Province of Ontario should adopt the C.S.A. truck tire retread standards, and M.T.C. should investigate whether rebuilt tires should be prohibited from the steering axle of larger and heavy trucks, similar to the school bus requirement.

4. The use of B trains should be encouraged and the proposed C.C.M.T.A./R.T.A.C. research on vehicle weights, dimensions and stability be integrated with the new U.S.A. overlength commercial vehicle study so as to avoid duplication of research effort.

5. Vigorous research should be continued by the M.T.C. and TRansport Canada into brake anti-lock and anti-jack-knife systems, because the presently available systems are not sufficiently reliable to warrant being made mandatory.

6. M.T.C. should monitor and evaluate the U.S. Federal Government proposed rear under-ride protection standard and M.T.C. should conduct an analysis of the feasibility, costs and benefits of introducing side under-ride protection standards for large trucks and tractor trailer combinations.

7. The overall commercial articulated vehicle length be increased in Ontario to allow the use of cab-behind-engine tractors, but a suitable king pin restriction or trailer combination length should be established.

8. The M.T.C., in cooperation with the Canadian Medical Association, should examine the truck drivers' complaints of excessive cab noise levels, heat and vibration, including their effects on cumulative fatigue.

9. Until the research evidence is clearer, truck drivers, like construction workers, should be exempted from the proposed 90 decibel noise limit under the Occupational Health and Safety Act, but they should not be exposed to greater than 95 decibels for a continuous period of over four hours.

10. All large trucks should be required to have clearly visible reflectorized markings on the sides and rear of their vehicles which meet the current Canadian Federal Motor Vehicle Safety Standard. Vehicles longer than 12.5 metres in overall length should be required to employ reflective markings in a sign indicating the vehicle is very long and further, that M.T.C. be charged with the responsibility of determining the optimum colour, type, size, luminance and composition of the reflective markings.

11. The Ministry of Transportation and Communications should continue its present selective commercial vehicle safety inspections at roadside locations and at fleet terminals.

12. Truck operators should be required to follow an approved maintenance program, including driver pre-trip and post-trip inspections, and written records should be kept at the home terminal for a period of three years for possible M.T.C. audit.

13. The 1977 document entitled "Recommended Inspection Procedure and Pass/Fail criteria" should be revised jointly by the M.T.C. and the Ontario Trucking Association and then form the basis for the approved inspection programs.

14. Ontario should join both the Canadian Vehicle Safety Alliance and the U.S. Commercial Vehicle Safety Alliance in order to achieve reciprocity.

15. Ontario should require mandatory inspection of all heavy trucks at a 26 week, or at 100,000 kilometres, whichever comes first, to meet standards set by the M.T.C., at approved garages, and paid for by the owner of the vehicle.

V 1. The Ontario Highway Traffic Act should be amended to include a provision for driving at reasonable and prudcnt speeds for the weather and traffic conditions prevailing, similar to those in the U.S.A. and other Canadian provinces.

2. The Ontario Ministry of Transportation and Transport Canada should support the current research on improved splash and spray suppression devices and should monitor the U.S.A. activity with respect to performance and new standards. They should be evaluated relative to the weather conditions in Ontario, with a view to ultimate adoption.

3. The M.T.C. should accelerate as much as possible its programs for rest areas; truck-climbing and passing lanes; warning signs; night-time road markers; and the use of safety barriers, crash cushions and escape ramps.

VI 1. The maximum speed limit for all highways in Ontario should be 90 kms./hr. especially for commercial vehicles. If the Government of Ontario rejects lowering the limit throughout the province for automobiles, then it should designate 90 km./hr. maximum for routes which have endemic traffic congestion or high accident rates, and enforce the 90 km./hr. limit for commercial vehicles.

2. The Ontario 60 metre permissible following distance should be increased to 90 metres and the penalties for violation made more severe.

3. The M.T.C., the O.P.P. and the trucking and automobile associations jointly should undertake a public education program about the hazards of tail-gaiting, lane hopping, driving in the truck passing lane and entering the path of a heavy truck too slowly.

4. The M.T.C. should accelerate its Traffic Management Program and include safety as a critical ingredient of its policy. Overhead changeable message signs, speeding too fast signs, and electronic monitoring of traffic have proven successful and should be implemented wherever traffic congestion or high accident rates are endemic.

5. The M.T.C. should accelerate any plans it may have for the provision of alternative truck routes for the Niagara Falls, Hamilton, Metro Toronto, Oshawa problem area. Planning should proceed as soon as possible for an additional outer Ring Road with appropriate truck access routes, for the Metropolitan Toronto area.

6. Municipalities should be given the authority to regulate both the times and routes for trucks and for the transportation of dangerous goods within their jurisdiction, except for provincial highways, which should remain the responsibility of the Ontario Minister of Transportation and Communications.

7. The Government of Canada should amend the Lord's Day Act in the manner recommended by the Law Reform Commission of Canada in 1976. Failing that, the 1975 recommendations of the Interministerial Committee on Sunday Trucking, for both Sunday and weekend trucking, should be implemented and the appropriate amendments made to the Ontario Highway Traffic Act.

8. Truck manufacturers must be encouraged to develop more comfortable seat belt assemblies for truck drivers and their use should be enforced.

VII 1. The M.T.C. should undertake an information program aimed at the motoring public explaining how trucks operate and how best to share the road with them safely. The M.T.C. should make use of roadside signs like the "Watchful Eyes" program on Highway 108.

2. All candidates for a Class D or Class A licence should be required to complete a first aid course equivalent to that provided for the St. John Ambulance Emergency First Aid Certificate, and all buses and heavy trucks should be required to carry a first aid box as set out in the Workers Compensation Act.

3. The M.T.C. should investigate the possibility of extending the probationary licence system to include the demerit point system, and determine the point levels at which truck drivers should be put on probation or have their licences suspended.

4. The Government of Ontario should require all motor vehicles to be equipped with a speedometer clearly visible to the driver.

5. The M.T.C. should establish the minimum specifications for tachographs which should then be made mandatory in all commercial vehicles exceeding 14,500 kgms. registered gross weight.

6. The fines and demerit points for speeding should be increased substantially and the speed above which a driver may be suspended should be lowered.

7. The O.P.P. should continue its program of saturation patrols and the Government of Ontario should provide the O.P.P. with the resources necessary to increase the number of its Selective Law Enforcement Patrols.

8. The Government of Ontario should amend the Highway Traffic Act to allow the prosecution of the operator of a commercial vehicle for traffic offences when detected and identified by remote surveillance systems.

9. The Government of Ontario should accept the recommendation of the O.T.A. that a new commercial vehicle operator's licence be established whereby every operator of a commercial motor vehicle may be held accountable for the performance of the drivers, the mechanical fitness of the vehicles used and the hours of work regulations

10. The Ontario Ministry of Labour should expedite its program to enforce the requirements of the Occupational Health and Safety Act in the trucking industry.

VIII 1. Transport Canada should not permit the importation of ultra-small motor vehicles intended for a single occupant and weighing less than 700 kgm. In any case they should not be permitted on public highways or multi-laned expressways until they are proven to be crash-worthy.

2. The present overlength vehicle regulations should NOT be changed, and overlength combinations, or those with more than three articulation points, should NOT be permitted in Ontario at this time.

3. The Ontario Government should request observer status on the new U.S. Department of Transport study of longer combination commercial motor vehicles on the National System of Interstate and Defence Highways. The M.T.C. should suggest that the study's terms of reference be extended to include the need for special driver qualifications, marshalling yards, speed limits, dangerous cargo restrictions, and the possible impact of such an intercity network on railways and shipping.

4. The Ontario Government should request the Government of Canada to implement the Transportation of Dangerous Goods Act and its regulations as soon as possible and, if it does not do so within a reasonable length of time, Ontario should implement its own Dangerous Goods Transportation Regulations.

APPENDIX I

ONTARIO COMMISSION ON TRUCK SAFETY

PUBLIC HEARING PRESENTATIONS

1. FRIDAY, NOVEMBER 27, 1981 - TORONTO

1. Select Committee on Highway Safety
   Mr. Fred Young

2. Ontario Truck Accident Overview - MTC
   Mr. Lawrence Lonero

3. Teamsters Joint Council
   Mr. Barry Adams, Mr. Fred Johnston

4. Hamilton Automobile Club
   Mr. Leo Laviolette

5. Ontario Trucking Association
   Mr. Stephen Flott

2. FRIDAY AND SATURDAY, JANUARY 29-30, 1982 - WINDSOR

1. Canadian Industrial Traffic League
   Mr. Don Hughes

2. Ontario Truck Inspections - MTC
   Mr. Lloyd McPhee

3. Highway Safety Research Institute
   Mr. James O'Day, Mr. Robert Ervin

3. FRIDAY, FEBRUARY 12, 1982 - SUDBURY

1. Transportation Safety Association of Ontario
   Mr. Harry Melnyk, Mr. Mike Holmes

2. Regional Municipality of Sudbury
   Mr. Toivo Rukholm

3. Ontario Motor League - Sudbury
   Mr. Ray Helsberg

4. Ontario Driver Licensing System - MTC
   Mr. Glenn Thomas

4. **FRIDAY, FEBRUARY 26, 1982 - KINGSTON**

   1. George Brown College Transportation Training Program
      Mr. Sean Donovan

   2. Motivational Factors in Truck Safety
      Dr. Gerald J.S. Wilde

   3. Advanced Driver Training
      Mr. William Ward

   4. Highway Transportation of Dangerous Goods - MTC
      Mr. A.G. Sharp

5. **THURSDAY AND FRIDAY, MARCH 11-12, 1982 - HAMILTON**

   1. Merv Orr's Transport Driver Training School
      Mr. Jody R. Orr

   2. United Parcel Service Canada Ltd.
      Mr. Glenn C. Smith

   3. Canadian Association of Movers
      Mr. G. Barrett

   4. Royal Insurance Company
      Mr. Jim O'Shell

   5. Red Star Express Lines
      Mr. Al DeRooce

6. **THURSDAY AND FRIDAY, APRIL 1-2, 1982 - OTTAWA**

   1. Canadian Trucking Association
      Mr. C. McLeod

   2. Commercial Driver Training
      Mr. David Hieatt

   3. Labour Canada
      Mr. Charles Weaver

   4. Truck Safety Standards and Accident Investigation - MTC
      Mr. Murray Hattin

   5. Canadian Medical Association
      Dr. William Ghent

7. **THURSDAY AND FRIDAY, MAY 6-7, 1982 - LONDON**

1. Canadian National Railways
   Mr. F.C. Robinson

2. Independent Truckers Association of Canada
   Mr. Chris Klingsh

3. Labatt's Ontario Breweries
   Mr. S. Bigus, Mr. T. Ozaki

4. Multidisciplinary Accident Investigation and Research Team
   Dr. Ed Nowak, Dr. Alan German

5. Markel Services Canada Limited
   Mr. Bruce Bedford

6. St. John Ambulance
   Mr. W. Leonard, Mr. W. Gibson, Mr. R. Phippen

8. **THURSDAY AND FRIDAY, JUNE 10-11, 1982 - THUNDER BAY**

1. Private Motor Truck Council of Canada
   Mr. R. Neal, Mr. R. Hardie, Mr. D. Shields

2. Highway Design and Traffic Engineering - MTC
   Mr. F. Devisser, Mr. M. Harmelink

3. Motor Vehicle Accident System - MTC
   Mr. C. Orlowski

4. Manitoba Trucking Association
   Mr. D. Hindmarsh

5. Ontario Forest Industries
   Mr. M. McKay

6. Driver Control - MTC
   Mr. R. Mackie

9. **THURSDAY AND FRIDAY, SEPTEMBER 23-24, 1982 - TORONTO**

1. Ontario Motor League - Toronto Club
   Mr. N.D. Gaskin

2. Ontario Trucking Association
   Mr. S. Flott

3. Hamilton Automobile Club
   Mr. A. Oakie

4. Canadian Institute for Radiation Safety
   Mr. R. Harris, Dr. H. Aiken

5. Teamsters Joint Council
   Mr. F. Johnston

6. Truck Safety - A Motorist's Perspective
   Mr. D. Batchelor

7. De Leuw Cather Canada Ltd.
   Mr. P.J. Kaulback

8. Canadian Pacific Railways
   Mr. R.A. Teoli, Mr. R. Lande

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ONTARIO COMMISSION ON TRUCK SAFETY
LIST OF ACTIVITIES

October 8, 1981 - Appointment of Commission

November 6, 1981 - O.C.T.S. Advisory Group Meeting
Toronto, Ontario

November 20, 1981 - Dr. William Ghent Interview
Canadian Medical Association
Kingston, Ontario

- Faculty of Law Seminar
'Swedish Drinking and Driving Experience'
Queen's University
Kingston, Ontario

November 27, 1981 - O.C.T.S. Public Hearing
Toronto, Ontario

December 4, 1981 - O.C.T.S. Advisory Group Meeting
Toronto, Ontario

January 13-15, 1982 - Coroner's Inquest
Hamilton, Ontario

January 17, 1982 - Heavy Truck Safety Seminar
Workshop on Human Factors in Transportation
Transportation Research Board
Washington, D.C.

January 29, 1982 - Visit to Driver Licensing Facilities
Drivers and Vehicles District Office
Ministry of Transportation and Communications,
Windsor, Ontario

- Visit to MTC Truck Inspection Station and Weigh Scale
Windsor, Ontario

January 29-30, 1982 - O.C.T.S. Public Hearing
Windsor, Ontario

February 2, 1982 - Motor Vehicle Safety Association Meeting
Toronto, Ontario

February 12, 1982 - O.C.T.S. Public Hearing
Sudbury, Ontario

February 15, 1982 - Board of Director's Dinner
Hamilton Automobile Club
Hamilton, Ontario

February 24, 1982 - Safety Researchers' Group Meeting
Joint Program in Transportation
University of Toronto/York University
Toronto, Ontario

February 26, 1982 - O.C.T.S. Public Hearing
Kingston, Ontario

March 2, 1982 - O.C.T.S. Advisory Group Meeting
Toronto, Ontario

March 4, 1982 - Traffic Sergeants Seminar
Ontario Provincial Police
Brampton, Ontario

March 11, 1982 - Trip in the Cab of a Tractor-Trailer Unit from Kingston to Toronto.

March 11-12, 1982 - O.C.T.S. Public Hearing
Hamilton, Ontario

March 29-April 1, 1982 - Study Week in Traffic Safety
University of Toronto/Queen's University
Toronto, Ontario

April 1-2, 1982 - O.C.T.S. Public Hearing
Ottawa, Ontario

April 2, 1982 - Road and Motor Vehicle Safety Branch Interview
Transport Canada
Ottawa, Ontario

April 19, 1982 - Highway Users Federation for Safety and Mobility Interview
Washington, D.C.

April 20, 1982 - American Association of Motor Vehicle Administrators Interview
Washington, D.C.

- American Trucking Association Interview

- International Brotherhood of Teamsters Interview

- Truck Trailer Manufacturers Association Interview

April 21, 1982 - Interstate Commerce Commission Interview
Washington, D.C.

- National Highway Traffic Safety Administration Interview

April 22, 1982 - Federal Highway Administration Interview
Washington, D.C.

- 'Road Gang' Luncheon Meeting

- Bureau of Motor Carrier Safety Interview

April 23, 1982 - American Automobile Association Interview
Falls Church, Virginia

- AAA Foundation for Safety Interview

April 21-23, 1982 - Coroner's Inquest
Belleville, Ontario

May 6-7, 1982 - O.C.T.S. Public Hearing
London, Ontario

May 13, 1982 - MCL Motor Carriers Ltd. Interview
Toronto, Ontario

- ICL International Carriers Ltd. Interview

- O.C.T.S. Advisory Group Meeting

- Transportation Regulation Operations Division Interview
Ministry of Transportation and Communications

May 25, 1982 - Transport and Road Research Laboratory Interviews
i) Road User Characteristics Division
ii) Vehicle Stability and Safety Measures Division
Crowthorne, England

- Visit to British Transport and Road Research Laboratory Motor Vehicle Test Centre
Crowthorne, England

May 26, 1982 - Department of Environment and Transport Interviews
i) Driver Testing and Training Division
ii) Vehicle Standards and Engineering Division
iii) Freight Control Division
iv) Road Safety Directorate
London, England

June 10-11, 1982 - O.C.T.S. Public Hearing
Thunder Bay, Ontario

June 17, 1982 - Trip in an Ontario Provincial Police Cruiser on Routine Night Patrol
Kingston, Ontario

June 22, 1982 - Trip in the Cabs of Three Overlength Truck Configurations between Oshawa and Belleville and return.

- Visit to MTC Truck Inspection Station and Weigh Scale
Bowmanville, Ontario

June 24, 1982 - Ontario Trucking Association Interview
Toronto, Ontario

- Ontario Petroleum Association Interview

- O.C.T.S. Advisory Group Meeting

July 6, 1982 - Toronto Club Interview
Ontario Motor League
Toronto, Ontario

- Research and Development Branch Interview
Ministry of Transportation and Communications

July 8-9, 1982 - Visit to Motor Vehicle Test Centre
Transport Canada
Blainville, Quebec

September 9, 1982 - Visit to Commercial Driver Training Program, George Brown College
Toronto, Ontario

September 10, 1982 - Research and Development Branch Interview
Ministry of Transportation and Communications
Toronto, Ontario

September 23-24, 1982 - O.C.T.S. Public Hearing
Toronto, Ontario

October 15, 1982 - O.C.T.S. Advisory Group Meeting
Toronto, Ontario

December 9, 1982 - Private Vocational Schools Program Interview, Ministry of Colleges and Universities
Toronto, Ontario

APPENDIX III

ONTARIO COMMISSION ON TRUCK SAFETY
LIST OF INTEREST GROUPS WHO HAVE MADE WRITTEN OR VERBAL SUBMISSIONS

1. Select Committee on Highway Safety
   Mr. Fred Young

2. Ministry of Transportation and Communications
   Ontario Truck Accident Overview
   Mr. Lawrence P. Lonero

3. Teamsters Joint Council 52
   Mr. Fred Johnston, Mr. Barry Adams

4. Hamilton Automobile Club
   Mr. Al U. Oakie, Mr. Leo Laviolette

5. Ontario Trucking Association
   Mr. Arnold M. Nussey, Mr. Robert V. Rumley, Mr. Steven Flott

6. The Canadian Industrial Traffic League
   Mr. Don B. Hughes

7. Ministry of Transportation and Communications
   Ontario Commercial Motor Vehicle Inspection Program
   Mr. Lloyd McPhee

8. *Highway Safety Research Institute
   University of Michigan
   Mr. James O'Day, Mr. Robert Ervin

9. Ontario Motor League - Windsor Automobile Club
   Mr. David Butler

10. Transportation Safety Association of Ontario
    Mr. Harry Melnyk, Mr. Mike Holmes, Mr. Mike Lepage

11. Regional Municipality of Sudbury
    Mr. Toivo Rukholm, Mr. H.R. Akehurst

12. Ontario Motor League - Sudbury Automobile Club
    Mr. Ray R. Helsberg

13. Ministry of Transportation and Communications
    Driver Licensing Program
    Mr. Glenn Thomas

14. George Brown College
    Commercial Driver Training Program
    Mr. Sean Donovan

15. *Queen's University
    Motivational Factors in Truck Safety
    Dr. Gerald J.S. Wilde

16. Ontario Motor League - Eastern Ontario Club
    Advanced Driver Training
    Mr. William E. Ward

17. Eastern Ontario School of Trucking
    Mr. Peter Unwin

18. *Ministry of Transportation and Communications
    Highway Transportation of Dangerous Goods
    Mr. A.G. Sharp

19. Merv Orr's Transport Driver Training School
    Mr. Mervin Orr, Mr. Jody Orr

20. United Parcel Service Canada Ltd.
    Mr. Glenn C. Smith

21. *Canadian Association of Movers
    Mr. G. Barrett

22. Royal Insurance Company
    Mr. Jim O'Shell

23. Red Star Express Lines
    Mr. Albert T. DeRoose

24. Laidlaw Motor Carrier Group
    Mr. D.R. Gowland, Mr. George A. Cole

25. The Corporation of the City of Hamilton
    Mr. R.J. Desjardins

26. Hamilton Automobile Club
    Mr. A.U. Oakie

27. Lackie Bros. Limited
    Mr. Jeff Hill

28. Canadian Trucking Association
    Mr. Cameron McLeod

29. *Hieatt and Associates Inc.
    Commercial Driver Training
    Mr. David Hieatt

30. *Labour Canada
    Mr. Charles Weaver

31. Ministry of Transportation and Communications
    Vehicle Safety Standards and Accident Investigation
    Mr. Murray Hattin

32. Canadian Medical Association
    Dr. William Ghent

33. Greater Ottawa Truckers Association
    Mr. R. Leo Sauve

34. Travellers Insurance Company
    Mr. John H. Schaefer

35. Canadian National Railway
    Mr. F.C. Robinson

36. *Independent Truckers Association of Canada
    Mr. Chris Klingsh

37. *Labatt's Ontario Breweries
    Mr. Sam Bigus, Mr. Tak Ozaki

38. *University of Western Ontario
    Multidisciplinary Accident Investigation and Research Team
    Dr. Ed Nowak, Dr. Alan German

39. St. John Ambulance
    Mr. W. Leonard, Mr. W. Gibson, Mr. R. Phippen

40. Markel Services Canada Ltd.
    Mr. Bruce Bedford

41. The Ontario Milk Transport Association
    Mr. R.M. Elliott

42. Auto Steering Trailers Limited
    Mr. N. Royce Curry

43. Private Motor Truck Council of Canada
    Mr. Russ Neal, Mr. Bob Hardie, Mr. Dan Shields

44. Ministry of Transportation and Communications
    Highway Design and Traffic Engineering
    Mr. Frank DeVisser, Mr. Milt Harmelink

45. Ministry of Transportation and Communications
    Motor Vehicle Accident System
    Mr. Chester Orlowski

46. Manitoba Trucking Association
    Mr. Doug Hindmarsh

47. Ontario Forest Industries Association
    Great Lakes Forest Products Limited
    Mr. Morris McKay, Mr. Norman White

48. Ministry of Transportation and Communications
    Driver Licensing and Control Programs
    Mr. Richard Mackie

49. Ontario Motor League - Northwestern Ontario Club
    Mrs. Dorothy Chambers

50. Canada Safety Council
    Traffic Section Advisory Committee
    Mr. C. Richard Greene

51. Thunder Bay Fleet Management and Driver Training Services Inc.
    Mr. Ray E. Strawson, Mr. Keith J.F. Jobbitt

52. Lakehead University
    The Resource Centre for Occupational Health and Safety
    Dr. R. Rosehart

53. Ontario Provincial Police
    Commissioner James L. Erskine

54. Ontario Petroleum Association
    Mr. Gordon Ptolemy, Mr. Don Henderson, Mr. David Ross

55. Ontario Safety League
    Mr. S.F. Andrunyk

56. MCL Motor Carriers Ltd.
    Mr. Dave N. Flett

57. ICL International Carriers Ltd.
    Mr. G.M. Foster

58. Motor Vehicle Safety Association
    Mr. R. Bradfisch

59. Buffetts' Limited - Bus, Truck and Car Service
    Mr. Don Buffett

60. FCI - Fiba Canning Inc.
    Mr. Hugh J. Canning

61. The Canadian Manufacturers' Association
    Mr. V.R. Denholm

62. Hutchinson Industries
    Mr. Ralph Hutchinson

63. Inter-City Truck Lines (Canada) Ltd.
    Mr. Rex Moore

64. D. and W. Forwarders Inc.
    Mr. Walter Veenstra

65. Forest Product Accident Prevention Association
    Mr. Leslie W. Wills

66. Transport Training (Norfolk) Limited
    Mr. Neville Stafford

67. Maple Lodge Farm Ltd.
    Mr. Glen Laffin

68. The Ontario Traffic Conference
    Mr. D.J. Russell

69. Coroner's Inquest
    Dr. R.E. Porter

70. H. Ruhl Machinery Co. Ltd.
    Mr. H. Ruhl

71. Hamilton Automobile Club
    Mr. A. Oakie

72. *Canadian Liquid Air Ltd.
    Mr. J. Lukasik

73. Ministry of Transportation and Communications
    Commercial Vehicle Research
    Mr. Peter Smith

74. Ontario Motor League - Toronto Club
    Mr. Neil D. Gaskin

75. Canadian Institute for Radiation Safety
    Mr. R. Harris, Dr. D.M. Smyth, Dr. J.H. Aitken

76. C.P. Rail - Intermodal Services
    Mr. R. Teoli, Mr. R. Lande

77. Construction Safety Association of Ontario
    Mr. L. Sylvester

78. DeLeuw Cather, Canada Ltd.
    Mr. Peter J. Kaulback

79. Ontario Hydro
    Mr. Dennis C. Flaherty

80. Hamilton Wentworth Council on Road Trauma
    Dr. P.R. Knight, Ch.M., F.R.C.S. (C)

* verbal presentation

APPENDIX IV

MEDICAL STANDARDS

ONTARIO REGULATION 462
UNDER THE HIGHWAY TRAFFIC ACT

S. 7. Qualifications required by every applicant for or holder of a driver's licence are that the applicant or holder,

(a) does not suffer from any mental, emotional, nervous or physical disability likely to significantly interfere with his ability to drive a motor vehicle safely; and

(b) is not addicted to the use of alcohol or a drug to an extent likely to significantly interfere with his ability to drive a motor vehicle safely. O. Reg. 906/76, s.8.

S. 9.-(1) Subject to subsection (3), qualifications required by an applicant for or a holder of a Class A,B,C,D,E, or F driver's licence are that the applicant or holder,

(a) has no physical deficiency or impairment likely to interfere with the safe driving of a motor vehicle of the applicable class;

(b) has no history or clinical diagnosis of diabetes that requires insulin for control;

(c) is not taking any drug that could, in the dosage prescribed or in the dosage recommended by the manufacturer, impair his ability to drive a motor vehicle of the applicable class safely;

(d) has no established medical history of myocardial infarction, angina pectoris, coronary insufficiency or thrombosis;

(e) has no established medical history of heart disease including arrhythmia or of respiratory dysfunction likely to interfere with the safe driving of a motor vehicle of the applicable class;

(f) is not suffering from an aorti aneurysm, whether resected or not·

(g) is not suffering from hypertension accompanied by postural hypotension resulting in giddiness when under treatment,

(h) has no established medical history of loss of consciousness or awareness due to a chronic or recurring condition;

(i) has no established medical history of a disorder of the musculoskeletal or nervous system that may interfere with the safe driving of a motor vehicle of the applicable class;

(j) has no established medical history of an intractable psychotic or psychoneurotic disorder, having particular regard for sustained hostile, aggressive, paranoid, suicidal or other destructive tendencies or depression unless it is medically determined that the condition from which such person has suffered is corrected or controlled;

(k) has a visual acuity by Snellen Rating, with or without the aid of corrective lenses, no poorer than 20/30 in the better eye and 20/50 in the weaker eye; and

(l) has a horizontal visual field of at least 120 degrees in each eye as measured by confrontation tests. O. Reg. 906/76, s.10(1).

-(2) A qualification required by an applicant for or holder of a Class B,C,E, or F driver's licence is that the applicant or holder is able to perceive in his better ear, with or without the aid of a hearing aid, a forced whispered voice at a distance of 1.5 metres or, if tested by the use of an audio-meter device, has a loss in his better ear of no greater than forty decibels at 500, 1,000 and 2,000 hertz. O. Reg. 906/76, s. 10(2); O. Reg. 568/78, s.2.

-(3) The conditions described in clause (1)(d) shall not disqualify an applicant for or a holder of a Class D driver's licence where it is medically determined that a full recovery has been accomplished and there is no established medical history of a second occurrence of myocardial infarction or thrombosis or recurring angina pectoris. O. Reg. 906/76, s. 10(3).

S.10. Qualifications required by an applicant for or a holder of a Class G,L,M, or R driver's licence are that the applicant or holder have,

(a) a visual acuity by Snellen Rating, with or without the aid of corrective lenses, no poorer than 20/40 in the better eye, and

(b) a horizontal visual field of at least 120 degrees by confrontation tests. O. Reg. 906/76, s. 11.

TYPE OF VEHICLE INVOLVED IN ALL ACCIDENTS 1980-1981

CLASS OF DRIVER LICENCE REQUIRED		TYPES OF VEHICLES	1980 FATAL	1980 PERSONAL INJURY	1980 PROPERTY DAMAGE	1980 TOTAL	1981 FATAL	1981 PERSONAL INJURY	1981 PROPERTY DAMAGE	1981 TOTAL
PASSENGER VEHICLES	G	Passenger Car/Station Wagon	1,381	91,159	182,666	275,206	1,234	90,543	183,365	275,142
	G	Taxi/Limousine	5	292	540	837	4	232	416	652
	G	Hearse	0	4	4	8	0	0	3	3
	G	Dune Buggy	2	8	4	14	0	16	11	27
	F	Ambulance	0	44	52	96	0	36	78	114
	G	Fire Department Vehicle	0	11	36	47	2	11	26	39
	G	Police Force Vehicle	2	229	258	489	2	232	254	488
	G	Public Utility Emergency Vehicle	0	0	2	2	0	0	5	5
	G	Passenger Van	16	533	861	1,410	7	903	1,821	2,731
	G	Other Passenger Vehicle	1	46	99	146	2	99	208	309
PASSENGER VEHICLES AND TRAILERS	G	P.V. and House Trailer	0	35	81	116	0	27	61	88
	G	P.V. and Boat Trailer	3	37	103	143	1	30	98	129
	G	P.V. and Tent Trailer	1	24	65	90	0	24	40	64
	G	P.V. and Utility Trailer	0	24	78	102	0	46	82	128
	G	P.V. and Other Trailer	0	114	251	365	2	85	235	322
	G	Other P.V. and Trailer	3	13	58	74	4	14	16	34
TRUCKS	D	Truck with Concrete Mixer	3	30	44	77	1	26	53	80
	D	Truck with Stake or Platform Body	21	355	956	1,332	17	379	974	1,370
	D	Truck with Tank Body	0	88	214	302	4	81	208	293
	D	Truck with Dump Body	16	476	1,053	1,545	19	452	1,096	1,567
	G	Tow Truck	1	96	241	338	0	102	277	379
	D	Tractor not pulling a trailer	4	56	117	177	5	71	156	232
	G	Pick-up Truck	167	8,229	17,908	26,304	196	8,197	18,506	26,899
	G	Delivery van	87	4,467	10,063	14,617	115	4,280	10,324	14,719
	G	Pick-up Camper	2	12	39	53	0	10	30	40
	D	Fire Truck	1	7	15	23	0	2	16	18
	D	Other Truck	10	315	947	1,272	7	499	1,380	1,886
	G	Other Truck	2	275	837	1,114	2	410	982	1,394
	D	Tow Truck	0	31	111	142	1	29	50	80
TRUCK AND TRAILER	G	Pick-up and recreation trailer	0	18	49	67	1	2	18	21
	G	Pick-up and recreation semi-trailer	0	5	6	11	2	9	26	37
	G	Pick-up and other semi-trailer	3	108	256	367	6	88	297	391
	D	Truck/trailer-dump	1	8	28	37	0	11	27	38
	D	Truck/trailer-frame	0	1	3	4	0	3	9	12
	D	Truck/trailer-tank	0	2	4	6	1	1	12	14
	D	Truck/trailer-stake or platform body	0	5	29	34	5	13	35	53
	D	Truck/trailer-van	0	3	26	29	1	11	23	35
	D	Truck and pole trailer	0	0	5	5	0	0	1	1
	G	Tow truck hauling a disabled vehicle	1	8	27	36	0	12	40	52
	D	Other truck/trailer	1	10	16	55	0	7	21	29
	G	Other truck/trailer	1	14	40	55	0	10	19	29
	A	Other truck/trailer	1	16	35	52	1	10	23	34
	D	Tow Truck Hauling a disabled vehicle	2	7	38	47	0	16	23	39
TRACTOR AND SEMI-TRAILERS	A	Tractor/semi-trailer-dump	3	59	109	171	5	73	106	184
	A	Tractor/semi-trailer-frame	0	6	12	18	0	9	18	27
	A	Tractor/semi-trailer-tank	3	64	95	162	5	50	124	179
	A	Tractor/semi-trailer-stake or platform	2	60	140	202	3	118	227	348
	A	Tractor/semi-trailer-van	13	377	1,064	1,454	24	345	932	1,301
	A	Tractor/semi-trailer-concrete mixer	0	0	4	4	0	0	6	6
	A	Tractor/semi-trailer float	19	118	196	333	25	56	167	248
	A	Tractor/semi-trailer-car transport	2	31	35	68	6	5	9	14
	A	Tractor/semi-trailer-other	79	897	1,990	2,966	49	1,004	2,417	3,470
	A	Tractor/semi-trailer and pup-dump	0	9	18	27	1	2	12	15
	A	Tractor/semi-trailer and pup-frame	0	1	0	1	0	2	1	3
	A	Tractor/semi-trailer and pup-tank	1	5	10	16	0	6	13	19
	A	Tractor/semi-trailer and pup-stake or platform	1	3	4	8	2	3	11	16
	A	Tractor/semi-trailer and pup-van	1	10	13	24	1	4	11	16
	A	Tractor/semi-trailer and pup-other	2	34	58	94	4	13	35	52
	A	Tractor/semi-trailer and semi-trailer-tank	1	0	10	11	1	1	7	9
	A	Tractor/semi-trailer and semi-trailer stake or platform	0	2	4	6	1	2	4	7
	A	Tractor/semi-trailer and semi-trailer-van	0	2	3	5	2	3	6	11
	A	Tractor/semi-trailer and semi-trailer-other	2	13	25	40	3	15	32	50
BUS	C	Transit - Intercity	0	83	139	222	0	97	241	338
	C	Transit - Urban	14	754	1,378	2,146	13	793	1,317	2,123
	F	Coach - Intercity	2	21	40	63	0	18	47	65
	F	Coach - Urban	1	25	37	63	1	24	47	72
SCHOOL VEHICLES	E	School bus or School van-Seating capacity 10-23	0	36	52	88	1	42	61	104
	B	School bus — Seating capacity 24 or over	5	201	471	677	3	202	516	715
	G	School van — Seating capacity under 10	0	7	10	17	0	7	4	11
	G	Station wagon	0	4	2	6	0	1	7	8
	C	Other bus	0	18	44	62	0	38	79	117
OTHER MOTOR VEHICLES	G	Motor home	2	32	98	132	2	35	107	144
	M	Motorcycle	103	3,922	382	4,407	107	4,577	508	5,192
	G	Moped	0	77	5	82	0	61	3	64
NON-MOTOR VEHICLES	G	Snowmobile	12	90	41	143	4	82	43	129
		Farm Tractor	7	103	181	291	3	84	145	232
		Tractor or construction equipment	1	53	177	231	2	53	167	222
		Train	17	101	122	240	21	99	129	249
		Street car	0	109	291	400	1	117	318	436
		Bicycle	36	3,425	62	3,523	47	3,527	77	3,651
		Snow Plow	0	4	12	16	0	2	13	15
		Go-cart	0	3	0	3	0	2	0	2
		Horse and buggy	0	7	5	12	1	6	4	11
		Other	0	8	28	36	1	6	34	41
		Unknown	9	2,230	11,132	13,371	6	2,491	11,713	14,210
		Total	**2,075**	**120,219**	**236,764**	**359,058**	**1,981**	**121,104**	**241,057**	**364,142**

Source: Ontario Motor Vehicle Accident Facts, 1981